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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Hackh's chemical dictionary [American and British usage], revised and edited by J. Grant (*Philadelphia: Blakiston Co., 1944, 3. ed., rev., pp. 925+, illus. 270*).—This dictionary, containing more than 57,000 definitions, presents clear statements of chemical theories, laws, and rules; accurately describes the elements, compounds, minerals, drugs, vegetable and animal products; lists concisely the important reactions, processes, and methods; mentions briefly chemical apparatus, equipment, and instruments; and notes the names of investigators who have built up the science. Also included is the collateral vocabulary of physics, astrophysics. geology, mineralogy, botany, zoology, medicine, and pharmacy, and, also, the pertinent jargon of industry, mining, and commerce. In the present edition the whole dictionary has been completely revised and brought up to date, with especial care to balance the treatment from the American and British point of view. There has been no important departure from the treatment in earlier editions except for the omission of pronunciation.

Soil and plant analysis, C. S. Piper (*New York: Interscience Pubs., 1944, pp. 368+, illus. 19*).—This is a photo offset reprint of the publication noted previously (E. S. R., 90, p. 722).

Semimicrodetermination of the exchange capacity of soils, E. C. Cantino. (Univ. Calif.). (*Soil Sci., 57 (1944), No. 6, pp. 399–404, illus. 2*).—A 1-gm. sample of the soil is placed in a 3- by 16-cm. centrifuge tube containing 25 cc. of ammonium acetate. The mixture is thoroughly agitated by hand to suspend temporarily as much of the soil as possible in the liquid phase. It is digested for 25 min. in a water bath maintained between 60° and 70° C. The contents are then centrifuged at a force of $10^4 \times$ gravity for 5 min. The supernatant liquid is decanted and a second 20-cc. portion of ammonium acetate added. The mixture is agitated, digested for 10 min., and centrifuged again. After three such treatments, the presence or absence of calcium is ascertained in the supernatant liquid. The digestion and centrifugation process described is continued until calcium (or other indicator ion) ceases to appear in the liquid phase. The soil is then digested for several minutes with a final 10 cc. of reagent and centrifuged. Generally, the exchange complex is saturated with ammonia after three to five centrifugations have been completed. Ten cc. of methyl alcohol (pH adjusted to 7 with NH_4OH or HCl) are added to the soil residue. The mixture is digested for 5 min. in a water bath maintained at 45°, followed by centrifugation. This procedure is continued until the color produced when 10 cc. each of the supernatant liquid and water and 2 cc. of Nessler's reagent are mixed is equivalent to that produced with methyl alcohol and water. The soil is then digested with a final 10 cc. of methyl alcohol, centrifuged, and alcohol removed by decanting. The ammonia is expelled from the saturated exchange complex by distillation with 1 gm. of granulated pumice, 5 gm. of magnesium oxide, and water to make a volume of 150 cc., in a distillation apparatus of dimensions specified in a diagram. The liberated ammonia is received in from 50 to 100 cc. of 0.02 N sulfuric acid and is determined by Nessler's reagent in a photoelectric colorimeter. A blank determination of the ammonia yielded in the distillation of 100 cc. of water with 5 gm. of magnesium oxide is also made.

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[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

The chemical composition of forage grasses from the Gulf coast prairie as related to soils and to requirements for range cattle, J. F. Fudge and G. S. Fraps (*Texas Sta. Bul. 644* (*1944*), *pp. 39*).—Though nearly all forages examined contained sufficient calcium, the phosphate and protein contents of the forage grasses grown on the soils of the Gulf coast prairie may be insufficient, the phosphate having been found inadequate and the proteins especially likely to be so when the grass is old or dried up. The grass which grew after mowing contained more phosphoric acid and protein than unmowed grass available at the same time.

The chemical composition of the 1,140 samples varied widely with differences in species, stage of maturity, and location. Protein and phosphate decreased markedly with advancing maturity; crude fiber and nitrogen-free extract, in general, increased slightly; and changes in calcium content were irregular. Protein and phosphate in nearly all of the samples ranged from fair to very deficient. As the plants became older, the proportion of samples which were deficient or very deficient in protein and phosphate increased markedly. At the mature stage, 92 percent of the samples were deficient in protein and 96 percent were deficient in phosphate. Johnson, Dallis, and Bermuda grasses were, in general, higher in protein, phosphate, and calcium than were the principal native species sampled.

Soils which contained relatively high percentages of nitrogen, active phosphate, and active lime produced young grass which contained higher percentages of protein, phosphate, and calcium than were found in grass produced on soils which contained lower amounts of these constituents. The relation of the composition of the soils to the composition of forage at intermediate and mature stages of growth was not so clear as for young forage.

The chemistry and technology of food and food products, I, edited by M. B. Jacobs (*New York: Interscience Pubs., 1944, vol. 1, pp. 952+, illus. 79*).—This volume, constituting the first part of an exhaustive treatment of the technology of food and food products, deals with the fundamental aspects of food chemistry which are common to all foods and with the descriptive aspects of particular food groups, including historical accounts, statistics, definitions, standards, and composition and chemistry of these food groups. Twenty-one collaborators, specialists in their particular fields, contributed to this volume. The chapters dealing with the fundamentals include the following: Introduction, by M. B. Jacobs (pp. 1–8); The Physical Chemistry of Foods, by J. L. St. John (pp. 9–48) (Wash. Expt. Sta.); The Carbohydrates, by E. F. Degering (pp. 49–87) (Purdue Univ.); Lipids, by M. M. Baizer and H. Zahnd (pp. 88–109); Some Aspects of the Chemistry of Amino Acids and Proteins, by H. Zahnd and M. M. Baizer (pp. 110–184); Enzymes, by K. G. Stern (pp. 185–228); Vitamins, Vitagens, and Hormones, by H. R. Rosenberg (pp. 229–269); Mineral Matters and Other Inorganic Food Adjuncts, by R. H. Carr (pp. 270–299) (Purdue Univ.); Coloring Matters in Foods, by C. F. Jablonski (pp. 300–326); The Digestion and Fate of Foodstuffs, by A. E. Wilhelmi (pp. 327–355); and Food Spoilage and Food Poisoning, by H. O. Halvorson (pp. 356–391). The chapters on foods and food products coordinate widely scattered material from official, scientific, and technical literature, with emphasis on up-to-date numerical values, and include the following: Milk, Cream, and Dairy Products, by M. B. Jacobs (pp. 395–434); Meat and Meat Products, by W. M. Urbain (pp. 435–472); Fish, Shellfish, and Crustacea, by M. E. Stansby (pp. 473–521); Poultry and Eggs, by M. E. Pennington (pp. 522–563); Edible Oils and Fats, by A. E. Bailey (pp. 564–590) (U. S. D. A.); Cereal Grains, by W. F. Geddes (pp. 591–685) (Univ. Minn.) Baking and Bakery Products, by W. H. Cathcart (pp. 686–727); Vegetables, Mushrooms, Nuts, and Fruits, by F. A. Lee (pp. 728–781) (N. Y. State Sta.); Carbohydrate and Sugar Foods, by E. F. Degering (pp. 782-809) (Purdue Univ.); Confectionery and Cacao Products, by M. Schoen (pp. 810–839); Coffee and Tea, by W. H. Ukers (pp. 840–875); and Flavors, Spices, and Condiments, by L. Worrell (pp. 876–901). Extensive bibliography citations are given by footnote in immediate conjunction with the text, and, in addition, a brief selected bibliography is presented in connection with each phase of the subject discussed. An exhaustive subject index of 50 pages facilitates access to the factual information presented.

Bibliography on butter oil, C. B. SHERFY (*U. S. Dept. Agr., Bibliog. Bul. 5 (1944), pp. 40+*).—The milk fat which remains after the curd and water have been removed from butter is termed butter oil and milk oil in the United States. Synonyms used in various English-, French-, and German-speaking countries are given. In the preparation of the annotations, the same terms have been used in referring to butter oil as were used by the author in the work cited. The bibliography includes material on the preparation, properties, keeping quality, and uses of pure milk fat; the manufacture, preservation, and storage of butter oil; and the conservation of shipping space in shipping it to the Tropics and other regions. Material dealing with milk fat in dairy products is not included.

Does linseed oil contain conjugated double bonds? L. L. NESBITT and E. P. PAINTER (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, pp. 31–35*).—The authors closely examined many linseed oils for the difference between the Wijs and Woburn iodine numbers and, by means of the ultraviolet light spectroscope, the cause of the valuable properties conferred upon drying oils by the presence of glycerol esters of fatty acids containing conjugated double bonds, the ultraviolet absorptions having been measured at the Indiana Experiment Station, which had the required apparatus.

It was found that linseed oils show slight absorption near that for triene conjugated systems; but the absorption is so small that conjugation, if present, is infinitesimal. For all practical purposes, linseed oils now produced do not contain conjugated systems.

The accuracy of the Mojonnier method for estimating milk fat in milk and cream, E. O. HERREID and D. W. WHITMAN. (Vt. Expt. Sta.) (*Jour. Dairy Sci., 27 (1944), No. 2, pp. 147–153*).—Single estimations of the milk-fat content of milk by the Mojonnier method can be expected to give an accuracy within 0.03 and 0.04 percent milk fat in at least 75 and 82 percent of the determinations, respectively. The mean of duplicate estimations can be expected to give an accuracy within 0.02 and 0.03 percent milk fat in approximately 86 and 94 percent, respectively, of the determinations in normal milk. Single estimations of the milk-fat content of normal cream by the Mojonnier method can be expected to give an accuracy of about 0.30 percent milk fat in about 86 percent of the determinations. Duplicate estimations for normal cream can be expected to give an accuracy within 0.30 percent milk fat in about 97 percent of the determinations.

Advances in enzymology and related subjects of biochemistry, IV, edited by F. F. NORD and G. H. WERKMAN (*New York: Interscience Pubs., 1944, vol. 4, pp. 332+, illus. 45*).—In this volume of monograph series (E. S. R., 89, p. 147), the following contributions are included: The Chemical Formulation of Gene the eluate preparation to the medium. The preparation of this concentrate from tomato juice had been described by Snell and Wright.

Chemical and biological assays of the nicotinamide-like substance formed in heated mixtures of asparagine and glutamic acid, M. R. Bovarnick (*Jour. Biol. Chem., 149 (1943), No. 1, pp. 301–302*).—The reaction product formed by heating a solution containing asparagine and glutamic acid (in the presence of ferrous sulfate and manganese sulfate) at 100° C. in a stream of oxygen for 8 days was extracted with ether. The ether extract, dried and dissolved in water, was analyzed for nicotinamide, biologically with *Lactobacillus arabinosus*, and chemically, both before and after hydrolysis, by the cyanogen bromide and aniline reaction. The good quantitative agreement between the three assays was interpreted as evidence that the reaction product was nicotinamide, thus supporting the earlier finding (E. S. R., 90, p. 292) that this heated mixture could replace nicotinamide as a growth factor for certain micro-organisms.

Formation of a nicotinamide-like substance from various amino acids and related compounds, M. R. Bovarnick (*Jour. Biol. Chem., 151 (1943), No. 2, pp. 467–475*).—This study was conducted to illustrate the mechanism of the reaction described above, in which neutral solutions of asparagine and glutamic acid heated for several days at 100° C. gave a reaction product capable of replacing nicotinamide as a growth factor for certain organisms. It is shown in this study that this reaction between asparagine and glutamic acid is catalyzed by manganese and iron salts and promoted by aeration. "Certain amino acids and nonnitrogenous dibasic acids have been found capable of substituting for glutamic acid in the above reaction. In the order of decreasing activity they are methionine, proline, citrulline, ornithine, α-ketoglutaric acid, glutaric acid, maleic acid, arginine, phenylalanine, hydroxyproline, fumaric acid, tyrosine, oxalacetic acid, lysine, serine, threonine, and malic acid. The ammonium salts of a few dibasic acids, aspartic, α-ketoglutaric, maleic, and malic, when heated with glutamic acid, produced small amounts of nicotinamide activity although their sodium salts were completely inactive."

N^1-methylnicotinamide, a metabolite of nicotinic acid in the urine, J. W. Huff and W. A. Perlzweig (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 395–400, illus. 1*).—A crystalline substance was isolated from human urine after dosage with nicotinamide by extraction of the urine with alcohol, concentration of the substance from the alcoholic solution by adsorption on Decalso, followed by elution with 25 percent KCl, extraction of the eluate with alcohol, and precipitation of the substance with picric acid. Decomposition of the picrate with HCl liberated the substance, which was finally obtained as the pure compound by crystallization from boiling absolute ethanol. From comparison with synthesized N^1-methylnicotinamide chloride in regard to content of nitrogen, chloride, and nicotine acid and in regard to the adsorption spectra, fluorescence, and the melting point of the picrates the two substances were found to be identical. This established the identity of the fluorescent substance, F_2, previously described by Najjar et al. (E. S. R., 85, p. 702).

A rapid method of estimating N^1-methylnicotinamide in urine, J. W. Huff and W. A. Perlzweig (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 483–484*).—The procedure involving adsorption on and elution from a zeolite column (permutite), as utilized in the method noted above, is eliminated and, instead, the N^1-methylnicotinamide is determined directly in butanol extracts of the urine. The procedure described involves treatment of the urine, made slightly alkaline, with Lloyd's reagent which completely destroys the fluorescence of the N^1-methylnicotinamide to give a negative blank. An aliquot of 1–5 cc. of the diluted urine containing 3γ–15γ and simultaneously an equal volume of the blank are placed in 125 cc. separatory funnels, extracted with *n*-butanol, and the fluorescence of the extracts measured. Data presented indicate substantial agreement between this direct method and the permutite method, even for amounts as low as 6γ–10γ/cc. Determinations by either method were uncertain at concentrations of 0γ–2γ/cc. "Trigonelline" values obtained by the method of Perlzweig et al. (E. S. R., 86, p. 712) and presented for comparison indicate that in human urine N^1-methylnicotinamide comprises nearly all the trigonelline thus determined. It is noted that since trigonelline does not affect the fluorescence measurement it is not necessary to omit trigonelline-containing foods (coffee, legumes) when nicotinic acid excretion tests are conducted by the direct method.

The direct colorimetric determination of urea in blood and urine, S. B. Barker (*Jour. Biol. Chem., 152 (1944), No. 2, pp. 453–463, illus. 3*).—The author describes a direct colorimetric procedure in which the urea is condensed with diacetyl monoxime in the presence of sulfuric acid, and the resulting color enhanced by the addition of potassium persulfate. From 10γ to 150γ of urea N, corresponding to 10–150 mg. of urea N per 100 cc. of blood, can be determined. By a supplementary dilution, this range can be extended to 250 mg. percent.

The method gave results on human blood filtrates and urines the same as those given by urease. The colorimetric results on dog urine also were very close to the urease values, but, in the case of dog blood, this procedure indicated from 1 to 6 mg. percent more "urea N" than the urease method shows to be present. The discrepancy was largely removed by treating the Somogyi zinc filtrate with permutite. The author notes, however, that such a modification "is entirely empirical, since the extra color cannot be attributed to any specific substance."

The fluorescence of vitamin A.—II, Ultraviolet absorption of irradiated vitamin A, H. Sobotka, S. Kann, W. Winternitz, and E. Brand (*Jour. Amer. Chem. Soc., 66 (1944), No. 7 pp. 1162–1164, illus. 3*).—The nature of the highly fluorescent substance responsible for the greenish fluorescence previously observed upon ultraviolet irradiation of alcoholic solutions of vitamin A esters (E. S. R., 91, p. 249) was investigated by a study of the ultraviolet absorption spectra of such solutions in the course of irradiation. The irradiated solution of vitamin A acetate in ethanol showed four absorption bands at wave lengths of 275, 328, 345–346, and 364–365 mμ. This spectrum suggested the presence of more than five conjugated double bonds. The second wave length, 328 mμ, was identical with that of vitamin A. The three longer wave lengths coincided with those of the absorption bands of the isoanhydro vitamin A, suggesting that the highly fluorescent irradiation product, while not identical with isoanhydro vitamin A, may constitute an excited form of the latter. The chromogenic power of irradiated vitamin A in the Carr-Price reaction was not greatly impaired until a secondary oxidative photoreaction led to a decrease and eventual disappearance of fluorescence. The absorption band at 275 mμ was apparently due to a chromogenic product of a less specific and possibly independent oxidative degradation of vitamin A.

The assay of purified proteins, enzymes, etc., for "B vitamins," R. J. Williams, F. Schlenk, and M. A. Eppright (*Jour. Amer. Chem. Soc., 66 (1944), No. 6, pp. 896–898*).—This investigation, carried out to gain insight into the possible importance of B vitamins as prosthetic groups in proteins known to possess unusual physiological functions, involved determinations of the various B vitamins, except riboflavin, in 33 protein, enzyme, hormone, and virus preparations; riboflavin was not determined, since its absence was suggested by absence of characteristic coloration of the preparations. Of the samples tested only two, namely, pancreatic amylase and the yeast carboxylase, contained significant amounts of any of the vitamins. The pancreatic amylase, a high potency preparation capable of yielding 11,000 times its weight of maltose, contained 4.1 mg. inositol per gram, and the carboxylase, in addition to the expected high thiamine value, yielded 131γ–145γ of niacin per gram. The viruses investigated were found to be nearly devoid of B vitamins; in this they differed from materials of animate origin, suggesting that viruses may be inanimate.

Improvements in the Lactobacillus casei assay for biotin, G. M. SHULL and W. H. PETERSON. (Wis. Expt. Sta.) (*Jour. Biol. Chem., 151 (1943), No. 1, pp. 201–202*).—A yeast supplement, adequate in the eluate factor of Hutchings et al. (E. S. R., 88, p. 175) but very low in biotin, for use in the basic medium for determining biotin by the *L. casei* method of Shull et al. (E. S. R., 87, p. 626) was prepared by a method described. This involved a modified elution procedure for removing most of the adsorbed eluate factor from the norit without eluting the adsorbed biotin. Another modification presented involved the prepartion of an inoculum which was independent of the drop size.

A microbiological method for the determination of choline by use of a mutant of Neurospora, N. H. HOROWITZ and G. W. BEADLE (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 325–333, illus. 2*).—A mutant strain of *N. crassa,* produced by ultraviolet irradiation of the wild type, was used as the test organism since it was found to be able to grow in a medium containing only salts (including certain trace elements), sugar, biotin, and choline, with growth response proportional to the amount of choline present up to the limit of about 40–50 µg. per 25 cc. of medium, and with failure of growth in the absence of choline. Of more than 40 compounds tested, only choline, lecithin, and methionine were found to support growth of the mutant. In analytical practice, choline was liberated from any lecithin present in the sample by preliminary hydrolysis accomplished by autoclaving the sample with 3 percent H_2SO_4 for 2 hr. at 15 lb. pressure. Following neutralization with $Ba(OH)_2$, the solution was treated with permutite, in order to separate the choline from the methionine, and the choline then eluted with 5 percent NaCl. The eluate, properly diluted to give final choline concentrations between 0.5γ and 20γ per 25 cc., was distributed among 250 cc. Erlenmeyer flasks and made up to 25 cc. with basal medium (containing no choline). After autoclaving and cooling, each flask was inoculated with a drop of spore suspension and incubated at 25° C. for 3 days, at the end of which time the pads were removed, pressed out on filter paper, dried at 90°, and weighed. Choline values were calculated from a plot of a standard series made up to contain 0γ–20γ per flask, and run anew with each new spores suspension used. Choline values determined on different amounts of the same solution generally agreed within 10 percent, and recoveries of added choline ranged from 90 to 110 percent of theoretical. Data are reported on the choline content of a number of natural products.

The chemical determination of thiamine and cocarboxylase in biological material, B. ALEXANDER (*Jour. Biol. Chem., 151 (1943), No. 2, pp. 455–465*).—Dilute hydrochloric acid extracts of animal tissues (dog liver, kidney, muscle) and cereals, and water extracts of feces, were analyzed for thiamine by the procedure utilizing the Prebluda-McCollum reaction as previously developed for urine (E. S. R., 90, p. 12). By simultaneously measuring the free and total thiamine in aliquots of the same material, a value for the phosphorlylated or cocarboxylase fraction was also obtained. Enzyme hydrolysis was utilized to liberate the thiamine from the cocarboxylase, while in the analysis for free thiamine care was taken to destroy naturally occurring phosphatases which might, by splitting cocarboxylase before analysis, give erroneously high values for free thiamine. Only very small amounts of free thiamine, representing but a small portion of the total thiamine, were found in animal tissue. The concentration of total thiamine and cocarboxylase in the tissues of the dogs used in the study were found to be increased somewhat by the intramuscular injection of thiamine hydrochloride in amounts of 2.0 mg. per kilo. Significant amounts of thiamine were found in human feces, and the amounts were increased somewhat by the oral or parenteral administration of thiamine. The thiamine values obtained by this method were between 10 and 15 percent lower than those obtained by the thiochrome method.

Comparison of thiamine values by chemical and bioassay methods, E. B. Brown, J. C. Hamm, and H. E. Harrison (*Jour. Biol. Chem., 151 (1943), No. 1, pp. 153–161*).—Since preliminary work had shown the original method of Hennessy and Cerecedo (E. S. R., 82, p. 588) to give values about 20 percent below the bioassay results, certain modifications of the chemical procedure were developed which resulted in better agreement, with the chemical values only about 10 percent lower than those obtained by the bioassay (rat growth) method. The modifications of the Hennessy and Cerecedo method included definite optimum time intervals for different steps in the process and a higher temperature (52°–55° C.) for the enzymatic hydrolysis with taka-diastase. Under the conditions employed for the enzymatic hydrolysis, clarase and polydase preparations were less suitable than the taka-diastase. Careful preparation of the Decalso by a procedure outlined was necessary for satisfactory activation for maximum adsorption and elution. It was particularly necessary to keep the activated Decalso moist in any interval preceding utilization. The differences in readings due to differences in color between sample extracts and the standard were corrected by calculating the readings to a standard transmission reference point. This calculation of readings gave values closer to bioassay results where sample extracts contained more color than the standard, thereby affecting the reading of the thiochrome to a greater extent in the sample than in the standard. It was also found that higher results were obtained for thiamine by thoroughly washing the residues remaining after hydrolysis of the sample in order to remove occluded thiamine. This step, however, required extra time and work.

The irreversible transformation of dehydroascorbic acid, B. Rosenfeld (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 281–303, illus. 4*).—Evidence is presented to indicate that at a pH of 7 and in the presence of phosphate buffer, the irreversible and nonoxidative transformation of dehydroascorbic acid probably involves scission of the 6-carbon chain with the quantitative formation of oxalic acid. In the presence of oxygen the oxalic acid is preceded by the formation of an oxalyl compound which is most likely to be oxalylthreonic acid. For the irreversible transformation to occur at pH 7, phosphate must be present. Phosphate causes catalytically the spontaneous formation of oxalic acid, but in the absence of phosphate the 6-carbon chain remains intact. The catalytic action of phosphate can be effectively replaced by cyanide. Parallel with the irreversible transformation, the dehydroascorbic acid undergoes another change involving transformation into two other products, (1) a reducing compound and (2) an oxidized derivative of dehydroascorbic acid. This change, though hastened by phosphate and cyanide, does not depend upon their presence; it probably does not occur in animal tissues since it assumes measurable proportions only at concentrations $> 1 \times 10^{-3}$ M. The reducing compound persists in its reducing power in acid solution and shows qualitatively the absorption characters of ascorbic acid in the ultraviolet region. The oxidized derivative is characterized by an intense yellow color at pH 7.

It is suggested that in the animal body the metabolic break-down of ascorbic acid starts with the irreversible transformation to the dehydro vitamin, the concentration of which will reach but a fraction of the actual ascorbic acid concentration in the living tissue due to the natural protective system for this vitamin, particularly the presence of excessive glutathione. The quantitative formation of oxalic acid as part of the biological degradation of ascorbic acid suggests a possible relationship between vitamin C metabolism and the normal urinary excretion of oxalic acid. This assumption is in agreement with the observed facts (1) that oxalate excretion is independent of the oxalate intake in the food, and (2) that the oxalate excretion in man (about 27 mg. daily) corresponds approximately to the daily requirement of 50 mg. of ascorbic acid.

The rapid determination of ascorbic acid by the adaptation of Stotz's method to plant materials, L. P. Pepkowitz. (R. I. Expt. Sta.). (*Jour. Biol. Chem., 151 (1943), No. 2, pp. 405–412*).—Stotz's method (E. S. R., 88, p. 153) for ascorbic acid in blood and urine is adapted for application to extracts of plant tissues prepared by homogenizing representative 30–50-gm. samples in 200 cc. of 1.0 percent metaphosphoric acid in a Waring blendor. The method depends upon the fact that unreduced 2,6-dichlorophenolindophenol can be selectively and quantitatively extracted from the reaction mixture with xylene and the fact that the xylene solution of the dye follows Beer's law, permitting quantitative determination in a photoelectric colorimeter with a filter transmitting at 500 mμ. Two procedures are presented to correct for extraneous xylene-soluble pigments contained in certain plant extracts. Because of its simplicity, the method is rapid, permitting 60–70 determinations to be made in a day. The method was found applicable to all plant materials tried, whether fresh, frozen, or dried, and to be particularly useful for highly colored or turbid extracts. Protocols of recovery experiments with a number of foods indicate a recovery of 99 percent. Other data show, in general, satisfactory agreement with the method of Bessey (E. S. R., 82, p. 14).

The determination of ascorbic acid in whole blood and its constituents by means of methylene blue; macro- and micromethods, A. M. Butler, M. Cushman, and E. A. MacLachlan (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 453–461*). —Macro- and microprocedures are described for the determination of ascorbic acid in oxalated whole blood, in the plasma, and in the buffy layer of white cell platelets separated from the red cells by centrifugation. The photochemical method employed involves the reduction of methylene blue by ascorbic acid in the presence of strong light at the optimum pH of 4.5 maintained by acetate buffer in the dye solution. To prevent the rapid reversal of this reaction, with the conversion of the leucomethylene blue back to the colored form the pH of the medium is changed by rapid addition of HCl immediately preceding discontinuance of the illumination. This stabilization permits a photocolorimetric determination without change in color. "Because methylene blue under the condition of the procedures developed is a more sensitive and specific oxidation-reduction indicator for ascorbic acid than are the commonly used indophenol indicators, its use provides micromethods that are more satisfactory than those heretofore available." Satisfactory analyses can be obtained with 0.2 cc. of capillary whole blood.

A new method for the bioassay of antiscorbutic substances: Assays of dehydroascorbic acid, 2-ketogulonic acid, iron ascorbate, and the effectiveness of oral and parenteral administration of ascorbic acid, B. S. Gould and H. Shwachman (*Jour. Biol. Chem., 151 (1943), No. 2, pp. 439–453, illus. 4*).—The method is based upon the observations of Shwachman and Gould (E. S. R., 88, p. 569) that an increase in serum "alkaline" phosphatase occurs in scorbutic guinea pigs after administration of a critical dose of ascorbic acid, and involves depletion of guinea pigs on a scorbutic diet to phosphatase levels of 3–5 units or lower, following which individual animals in respective groups are fed daily the sample equivalent (as determined by titration) of 0.2, 0.225, and 0.25 mg. of ascorbic acid. On the fifth day after the first dose the animals are bled and the serum phosphatase determined. In interpreting the results, it is considered that groups in which 50 percent or more of the animals show a decrease in serum phosphatase, while none shows a significant increase, have been receiving less than 0.225 mg. ascorbic acid daily; with most of the animals in a group showing an increase and some no extensive change, the group has been receiving the critical dose, 0.225 mg. If all show marked increases, the critical level may have been exceeded. Increases of about 10 percent should be disregarded in view of the probable error of the estimation. It is indicated, however, that a control assay with pure ascorbic acid should be carried out for any new stock of animals. Factors that might influence the assay, such as fasting, cod-liver oil feeding, age, and re-use of animals, are discussed. It was found possible to assay by this method substances of known and questionable potency as determined by other methods, such as dehydroascorbic acid, *d*-glucoascorbic acid, *d*-isoascorbic acid, 2-ketogulonic acid, and iron ascorbate. A study of the relative effectiveness of oral and parenteral administration of ascorbic acid suggested a loss of 27 percent when the vitamin was fed by mouth.

Factors influencing the bioassay of vitamin E, B. R. Homrich (*Jour. Nutr., 26 (1943), No. 4, pp. 391–398*).—An investigation of some of the factors influencing the bio-assay of vitamin E following methods essentially as described by Palmer (E. S. R., 79, p. 716) is reported with suggestions for certain improvements in technic. These include the discarding of rats having less than 7 and more than 14 implantations, dosing during the early days of pregnancy rather than prior to mating, autopsying prior to parturition to eliminate possible errors due to infanticide, and using a fat-free basal diet during the dosing period because of the destructive effect on vitamin E activity of lard and cod-liver oil.

[Studies of Penicillium and penicillin] (*Jour. Bact., 48 (1944), No. 1, pp. 120–122*).—Abstracts of the following papers are included: The Biological Whereabout of the Penicillia, by C. Thom (pp. 120–121); Biological Methods of Penicillin Assay, by R. B. McCormack, H. P. Jones, and G. Plaut, Microbiological Methods of Identification of Penicillin, by G. Rake and D. M. Hamre, and Development in Vivo and in Vitro of Strains of Organisms Resistant to Penicillin, by C. M. McKee and W. B. Dunham (all p. 121); and Penicillin and Therapy, by C. F. Church (p. 122).

A method for the assay of penicillin, N. G. Heatley (*Biochem. Jour., 38 (1944), No. 1, pp. 61–65, illus. 1*).—Full practical details are given of a method of assay applicable also to certain other antibiotics; it is said to compare favorably as regards speed and accuracy with most other technics and has been in routine use for nearly 4 yr. Less than 1 cc. of solution (which need not be sterile) is required for an assay, and the presence of ether or chloroform does not interfere. Quantitative information on limits of accuracy is given.

Disinfectant testing—F. D. A. method: Official method of U. S. Food and Drug Administration, U. S. Department of Agriculture, and National Association of Insecticide and Disinfectant Manufacturers for determination of phenol coefficients of disinfectants, G. L. A. Ruehle and C. M. Brewer (*Blue Book [Soap and Sanit. Chem.], 1944, pp. 205, 207–212*).

Disinfectants and antiseptics: A summary of scientific advances reported during 1943, E. G. Klarmann (*Soap and Sanit. Chem., 20 (1944), No. 1, pp. 109–117, 69–70*).

Methods for estimating the moisture content of foods in the dehydrator and in the equalizing bins, G. J. Bouyoucos and R. E. Marshall (*Michigan Sta. Tech. Bul. 197 (1944), pp. 29, illus. 9*).—This bulletin presents working details, illustrations of the equipment, and further experimental results for the method described in a preliminary report (E. S. R., 91, p. 119) for estimating the moisture content of foods in the dehydrator. In addition, the method is considered in detail in its application to determining moisture in material undergoing equalizing and final drying in bins. In this case the determination is accomplished by measuring the temperature of the warmed incoming air and that of the air after it has passed the product and is being exhausted from the bin. While moisture is being evaporated from the material the temperature of the exhaust air is considerably below that entering the bin. When the product reaches a low moisture content the amount of water evaporated is slight and the temperature of the exhaust air approaches that of the incoming air. Thus, when the product has a moisture content of about 20.9 percent there is a temperature differential of 43° F., but when the moisture is reduced to about 6.5 percent the differential is only about 9°. It is pointed out that "this method gives an indication of average moisture content of the whole mass of material and thus avoids the error due to unrepresentative sampling for moisture determination. It also eliminates the necessity of frequent sampling and making moisture determinations in the vacuum oven. Finally, it provides a convenient means of estimating the moisture content at any stage of the dehydration process."

AGRICULTURAL METEOROLOGY

Progress in meteorology, D. BRUNT (*Roy. Met. Soc. [London], Quart. Jour., 70 (1944), No. 303, pp. 1-12*).—An address summarizing the present state of meteorology, some of the outstanding problems of the future including the function of the university in training and research in meteorology, and the Royal Meteorological Society and the future of meteorology.

Meteorological mileposts, H. A. ZINSZER (*Sci. Mo., 58 (1944), No. 4, pp. 261–264*).

Meteorology in the warring forties: A review, C. CHAPMAN and C. F. BROOKS (*Geog. Rev., 34 (1944), No. 3, pp. 466–475*).—A review of 40 books on meteorology and climatology that have appeared since the war began in Europe.

An approach to quantitative forecasting of precipitation, A. K. SHOWALTER (*Amer. Met. Soc. Bul., 25 (1944), No. 4, pp. 137–142*).—The intent of this paper was to outline technics for estimating the magnitude of rainfall rather than to discuss general methods for forecasting its occurrence. Enough basic work has now been done to identify certain meteorological factors significantly related to rainfall magnitude, the more important of which—surface dew point, wind direction, wind velocity or pressure differences, and temperature gradients at 5 km.—are considered. Detailed technics and their reliability are discussed. While the forecaster is making his analysis of the synoptic situation there should be prepared for him a detailed chart showing the evaluation of ground conditions, stages of the principal river, recent rainfall over the basin, course of movement and magnitude of rainfall areas in adjacent regions, dew points at the surface and temperatures aloft at key stations, pressures and pressure differences at the surface and selected upper levels at key stations, stability of air masses in the region, distribution and changes of distribution of the precipitable water in the general area, and a general idea of the operational plans for release of water in the area. The next step is the preparation of the prognostic charts and the actual forecast. The future of quantitative forecasting appears to lie in prognostic charts of wind, pressure, and moisture distribution at sea level and 5,000 and 10,000 ft.

Correlation of ground-water levels and precipitation on Long Island, New York, C. E. JACOB (*Amer. Geophys. Union Trans., 24 (1944), pt. 2, pp. 564-573, illus. 3*).—"Long Island simulates in a general way an aquifer in the form of an infinite strip confined between parallel boundaries at constant head (sea level), over which recharge from precipitation is assumedly uniform. The nonsteady flow of water in this idealized system is analyzed, assuming provisionally that the effective thickness of saturated beds below sea level is great compared to the maximum height of the water table above sea level. The rate of accretion to the water table is assumed to vary discontinuously, supposedly being constant for each of the successive periods (yearly or monthly) and proportional to the average rate of precipitation during that period. The decay of the water-table profile, beginning with any one of the succession of superposed nonsteady states, is shown to follow in general a relation composed of terms varying with time as exp(–t/t_0), in which t_0 is a function of the effective porosity, the thickness, and the transmission constant of the aquifer. This exponential curve may be approximated by a parabola which is used to determine values of 'effective average rate of precipitation' from published records of annual or monthly precipitation. By the 'effective average rate of precipitation' at any time is meant that rate of precipitation which, had it been maintained uninterruptedly throughout the past, would have produced the same water-table profile as actually existed at that particular time. It is demonstrated that the effective average rate of precipitation may be determined also simply by cumulating departures from progressive averages of precipitation, multiplying the values thus determined by a known rational coefficient, and adding the appropriate initial value of effective average precipitation." Records of rainfall at the Battery in New York City and at Setauket, L. I., are analyzed by the procedure outlined.

Precipitation and stream flow, C. S. Jarvis *(Sci. Mo., 59 (1944), No. 2, pp. 96–100)*.—The general discussion presented revolves around the Mississippi Valley rainfall and runoff, variability of discharge, comparison of outstanding river systems, the value of fragmentary data, mean annual precipitation and evaporation over the globe, storage losses, and the rivers of Greenland.

On the measurement and frequency of traces of precipitation, H. Neuberger. (Pa. State Col.). *(Amer. Met. Soc. Bul., 25 (1944), No. 5, pp. 183–188, illus. 3)*.—According to international definition, a precipitation day is one on which precipitation falls in measurable quantity, the lower limit being 0.01 in. in the United States, Canada, and Newfoundland and 0.1 mm. in most other countries including Great Britain. All quantities not reaching these limits are termed "traces" and are omitted from most climatic summaries. It seems, however, that for comparative climatological studies, for agriculture, and to a certain extent for war climatological and other purposes the knowledge of the frequency of precipitation below the arbitrary margin may be of value. For the purpose of recording traces and the time of beginning and ending of precipitation as well as the type—rain, snow, or drizzle—a simple apparatus has been in use since December 1941; in this device the falling precipitation imprints itself on the smoked surface of a paper belt slowly moving under a slot in the cover by a synchronous motor. Another model automatically exposes a smoked glass or cardboard plate every hour. Detailed results and evaluation of the use of such equipment are presented.

Notes on the gradient wind in low latitudes, W. J. Gibbs *(Linn. Soc. N. S. Wales, Proc., 67 (1942), pt. 3–4, pp. 153–155, illus. 2)*.—It is believed apparent from the data presented that in latitudes less than 10°, the wind direction tends to a direction normal to the isobars from high to low pressure for straight or curved isobars.

Cold-front passages during persistent fog over the Maritime Provinces in spring, R. W. Longley *(Amer. Met. Soc. Bul., 25 (1944), No. 4, pp. 143–148, illus. 5)*.—This paper describes the effect of the rapid cooling that may occur in a current of warm air moving over the coastal waters about the eastern Maritime Provinces of Canada.

Mountain climates of the western United States, F. S. Baker. (Univ. Calif.). *(Ecol. Monog., 14 (1944), No. 2, pp. 223–254, illus. 21)*.—This paper aims to summarize the present published information on the climate of the western mountain ranges of the United States so that one may easily read the essential climatic data for specific elevations—particularly those features held to affect plant distribution. The general characteristics of mountain climates are discussed prior to the presentation of the detailed information which includes charts and graphs. Appendixes give computations of the mean temperature in months other than January and July and tabulated and explanatory data on the variability of rainfall. There are 40 references.

Weather observations at the Rice Experiment Station, Crowley, La., for the thirty-three-year period 1910 to 1942, inclusive, J. M. Jenkins. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 376 (1944), pp. 23*).—The year following establishment of this station weather instruments were installed for recording certain climatic conditions under which field experiments with rice are conducted and for accumulating weather data in the vicinity of Crowley, which is located in the principal rice-growing area of the United States. Summaries are presented in tables or text of the temperature, rainfall, snow, frozen rain, ice, evaporation, and wind velocity for the period covered.

SOILS—FERTILIZERS

Physical Land Surveys 32 and 34 (*U. S. Dept. Agr. Soil Conserv. Serv., Phys. Land Survey Nos. 32 (1944), pp. 61+, illus. 17; 34 (1944), pp. 55+, illus. 12*).—No. 32 deals with conditions in Muskingum and Guernsey Counties, Ohio, by C. L. Whiteford, A. H. Paschall, and E. C. Sease; and No. 34 in Polk County, Ga., by J. H. Winsor and C. L. Veatch.

Water-drop method of determining stability of soil structure, T. M. McCalla. (U. S. D. A. coop. Nebr. Expt. Sta.). (*Soil Sci., 58 (1944), No. 2, pp. 117–121*).—A soil lump weighing approximately 0.15 gm. was placed on a 1-mm. screen, and drops of distilled water 4.7 mm. in diameter, falling 30 cm. from a burette, were allowed to fall upon it. When a soil lump or aggregate was broken down and at the point of being washed through the screen, it was considered destroyed. The end point was sharp for the loessial subsoil, but for the more highly aggregated Marshall topsoil it was more difficult to determine, since the lump frequently broke into several small aggregates that were kept together with a spatula until broken down. Three sets of determinations with 20 individual determinations in each were made. Air-dry soil was used. The number of water drops required to destroy a lump of soil increased with reduction of soil or water temperature, but was less for a wet soil than for a dry one. When the size of the drop was decreased more drops were required to destroy the structure, but a smaller quantity of water was required. The water-drop fall of 30 cm. and a soil lump size of 0.15 gm. were found satisfactory for Peorian loess subsoil and Marshall silty clay loam topsoil, but more variation in the number of drops required to destroy the soil structure was encountered with Marshall topsoil than with loessial subsoil.

Determination of certain physical properties of forest soils.—I, Methods utilizing samples collected in metal cylinders, H. J. Lutz (*Soil Sci., 57 (1944), No. 6, pp. 475–487*).—The first paper of this series is concerned with sampling conditions and with procedures for measurement of pore volume, air capacity, water-holding capacity, and volume weight in samples of undisturbed soil collected in metal cylinders.

With respect to sampling, it is pointed out that, whenever possible, the moisture content of the soil should be at field capacity when sampling is carried out. This is to eliminate expansion of fine-textured soils that are sampled in dry condition and subsequently wetted and to obtain the more important advantage of the drainage of gravitational water from the soil body under natural conditions, with the result that the moisture content at field capacity is a more acceptable measure of water-holding capacity than can be obtained in the laboratory. As an illustration of the discrepancies which may be introduced by neglect of this precaution, the author cites the example of a Merrimac sandy loam in which the water-holding capacity, determined in the laboratory (samples in cylinders submerged in water for 24–48 hr., followed by drainage for 2 hr. on a sand flat), exceeded the field capacity by an average value of 22.5 ± 0.69 percent (volume basis).

Two schedules of procedure are presented for measuring the physical properties of soil samples collected in metal cylinders. Assuming that the soil to be investigated is at its field moisture capacity, both schedules will result in essentially the same values for field capacity (here taken as equivalent to water-holding capacity) and volume weight. Values for pore volume will be highest, and presumably most accurate, when the samples are treated according to one of the procedures in the schedule in which the sample is removed from the cylinder and allowed to stand in water for 24–48 hr., followed by boiling for 2 hr., and, finally, evacuation for 2–3 hr. "This treatment is very time-consuming and, for practical purposes, results in values nearly the same as those obtained by the preferred procedure . . . (as above, but the samples are not boiled)." Samples receiving the latter treatment averaged only 0.3 ± 0.07 percent lower in pore volume than samples receiving the boiling treatment. In a third treatment, the samples were neither boiled nor evacuated, but the volume of the soil material was determined in a pycnometer. Pore volume determined by this third treatment averaged 2.0 ± 0.32 percent less than by the procedure involving both boiling and evacuation. Results obtained by the procedure in which cylinders with contained samples were allowed to stand in water 24–48 hr., and then weighed under water, indicate pore-volume values averaging 4.7 ± 0.31 percent less than values obtained by both boiling and evacuation. Air-capacity values bear an intimate relationship to pore-volume values. If the latter are too low, the former will be correspondingly too low. On the other hand, if values for water-holding capacity are too high, air-capacity values will be correspondingly too low. It is further pointed out that removal of air from the sample in determining true specific gravity may be incomplete, and true specific-gravity determinations carried out in accordance with the procedure schedule not involving evacuation gave figures averaging 0.21 ± 0.01 lower than the values obtained in the schedule including evacuation for from 2 to 3 hr.

Soil development and plant nutrition.—II, Mineralogical and chemical composition of sand and silt separates in relation to the growth and chemical composition of soybeans, E. R. Graham. (Mo. Expt. Sta.). (*Soil Sci., 55 (1943), No. 3, pp. 265–273*).—The relation of the chemical composition of soybean plants, grown on substrates containing sands and silts from various locations and subjected to reaction with electrodialyzed acid clay, to the mineralogical and chemical analyses of these soil separates, was investigated in a continuation of the work previously noted (E. S. R., 89, p. 172).

No growth of the soybean plants could be obtained unless some calcium was released from the sands and silts treated with hydrogen clay. Acid clay action on silt and sand samples from certain locations made calcium, magnesium, and potassium available; samples from other locations provided only calcium and magnesium; other samples supplied only calcium; and still others gave no measureable amounts of any plant nutrients.

There were indications that phosphorus-bearing minerals, as measured by clay-mineral interactions used, are rarely found in sands and silts. These coarser soil separates may vary widely in calcium and quartz contents. Heavy feldspars were present in significant amounts in the samples from Iowa, Utah, North Dakota, and Kansas, and were almost absent from samples from Missouri, southern Illinois, and Mississippi. Soil classification based on the mineralogical composition of sands and silts is suggested as of help in considering soil productivity and soil needs for calcium, magnesium, and potassium treatments.

Physical characteristics of soils.—IX, Relation between ultraclay and volume of floc, A. N. Puri, B. Rai, and R. Pal (*Soil Sci., 58 (1944), No. 2, pp. 163–175, illus. 7*).—A continuation of the series (E. S. R., 91, p. 643).

A 1-percent soil suspension was prepared, after maximum dispersion by the HCl-NaOH method, and clay was pipetted off in the usual way. Four cc. of the clay suspension was put in a measuring tube, 1 cc. of 0.25 N $CaCl_2$ solution was added, and the suspension was centrifuged for 0.5 hr. The volume of the settled mass was read directly from the measuring tube, which was calibrated accurately up to 0.01 cc. The floc volume described is shown to depend on the particle size in the ultraclay range. The percentages of various ultraclay fractions present in a soil could be determined by measuring the floc volume of the soil. Variations in pH value and in time of aging are shown to affect the floc volume as well as the proportion of ultraclay.

Hydrogen-ion concentration of the important soils of the United States in relation to other profile characteristics.—I, Pedocal soils, E. H. Bailey. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 6, pp. 443–474, illus. 1*).—The soils here dealt with are confined to those of the Pedocal classification. H-ion determinations were made in duplicate with a hydrogen electrode on samples of each of the horizons of several carefully selected profiles of a considerable number of important soil series in the United States. These series are classified into the various great soil groups. Every profile studied is located on a great soil group association map of the United States.

The lime zones of the Pedocal profiles range from mildly alkaline to very strongly alkaline in reaction. In the grassland Pedocals, such as the Chernozem, Chestnut, reddish Chestnut, Brown, and reddish Brown soils, the horizons above the lime zones have virtually the same reaction range—medium-acid to strongly alkaline. In the Desert and Red Desert profiles, the horizons above the lime zones have virtually the same reactions as the lime zones. In the Sierozem profiles, the horizons above the lime zones tend to be more alkaline than those of the grassland Pedocals but not so alkaline as those of the two Desert groups. They are neutral to strongly alkaline.

The effect of soil physical conditions on moisture constants in the upper capillary range, W. O. Smith. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 1, pp. 1–16, illus. 4*).—The author discusses soil moisture constants in the upper capillary range from the standpoint of soil physical conditions, presenting some evidence to indicate that, at moisture equivalent, the water of a heavy soil which does not swell appreciably is largely contained in the textural pore space. At this moisture point, the textural pore space is held to be saturated, or nearly so. Conditions prevailing in a sand at moisture equivalent are quite different. The pore space is not usually saturated. Formulas for calculating the porosity of a heavy soil from its moisture equivalent and volume-weight or from its moisture equivalent and the density of its solids are given.

The conclusions "are based on limited data, and extensive study probably must be made to establish with certainty the behavior here postulated." Soil physical conditions, important in transfer processes such as the passage of heat or water, must also be considered when such moisture constants of the upper capillary range as moisture equivalent, field capacity, and normal moisture capacity are measured or used.

The dependence of field capacity upon the depth of wetting of field soils, E. A. Colman. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 1, pp. 43–50, illus. 6*).—A determination of field capacity by natural and artificial irrigation of mountain soils in situ and of a mixed, uniform soil has shown that these soils must be wetted 12–30 in. deep, the depth depending on the soil studied, before the surface layer will have attained a moisture content as high as its field capacity. Subsurface layers are shown to have lesser wetting zone thicknesses, but soil as deep as 30 in. is not raised to its maximum moisture until the wet front has penetrated from 36 to 42 in. below the soil surface. A tentative explanation relates the field-capacity values to the water supply available for drainage and the distribution of permeability and moisture potential gradients through the wet zone at the time when the drainage rate has become insignificantly small.

The results reported upon are held to suggest that shallow field irrigations or the irrigation and drainage of short soil columns in the laboratory do not necessarily provide valid measures of the field capacity of a soil.

The soils of equatorial regions, with special reference to the Netherlands East Indies, E. C. J. Mohr, trans. by R. L. Pendleton (*Ann Arbor, Mich.: J. W. Edwards, 1944, pp. 766+, illus. 259*).—A comprehensive coverage of these soils as translated from the Nederlandsch.

Soil building and pasture practices for Alaska, D. L. Irwin (*Alaska Sta. Cir. 4 (1944), pp. 5*).—A circular of practical information on soil management for maintenance of productivity. Special consideration is given to the management of pastures.

Removal of nutrients from the soil by crops and erosion, O. R. Neal (U. S. D. A. and N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 601–607, illus. 2*).—Analysis of material eroded from Collington sandy loam consisted in determining available nitrates by the Morgan method (E. S. R., 77, p. 302), together with total nitrates present. These results are considered in relation to like data for the original surface soil. The quantities of nitrogen, phosphoric acid, and potash removed by tomatoes and sweet corn and the quantities removed by erosion during the crop year are shown.

The average content of particles less than 50μ in diameter in the surface of the original soil amounted to 15.8 percent. The eroded material contained 58 percent of these size fractions. In comparison with the original surface soil the eroded material contained 4.7 times as much organic matter, 5.0 times as much nitrogen, 3.1 times as much P_2O_5, and 1.4 times as much K_2O. Chemical studies indicated that the percentage availability of P_2O_5 in the eroded material was equal to that in the soil. Potash in eroded material showed a percentage availability 3.7 times greater than that in the soil. Erosion losses of nitrogen, in comparison with crop removal, were comparatively small in all cases. Erosion losses of total phosphoric acid, where no cover crop or other conservation practice was used, were double the quantity removed by tomatoes or sweet corn. Where cover crop or cover crop and manure were used annually, the erosion loss continued to equal the quantity of P_2O_5 removed by either crop. The removal of total K_2O by erosion, where no conservation practices were employed, exceeded the removal of K_2O by tomatoes and was nearly four times as much as the removal by sweet corn. Where conservation practices as shown were employed, the removal of total K_2O by erosion was more than one-half as much as that by tomatoes and continued somewhat to exceed the quantity removed from the soil by sweet corn.

Effect of chaparral burning on soil erosion and on soil-moisture relations, A. W. Sampson. (Univ. Calif.). (*Ecology, 25 (1944), No. 2, pp. 171–191, illus. 9*).—Chaparral and its understory vegetation effectively protect the soil against abnormal erosion, and this protection favors relatively high infiltration capacity of the soil. The grazing of sheep on recently burned slopes may measurably increase erosion. The data indicate that heavy burning of slopes in excess of 30 percent will accelerate erosion in proportion to the degree of grazing and trampling.

Investigations in erosion control and reclamation of eroded land at the central Piedmont conservation experiment station, Statesville, N. C., 1930–40, T. L. Copley, L. A. Forrest, A. G. McCall, and F. G. Bell. (U. S. D. A. coop. N. C. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 873 (1944), pp. 66+, illus. 21.*)—This is one of a series of bulletins (E. S. R., 91, p. 256) covering the first 10 yr. of experimental work at each of the 10 original soil erosion experiment stations.

The station was established to serve the central Piedmont problem area, extending from central Virginia to the southern South Carolina-Georgia boundary, in which the Cecil soil series comprises approximately two-thirds of the area. Cotton, corn, and tobacco are the leading crops grown in the area. Approximately one-third of the total land area is used as active cropland. Small farm units predominate, and more than one-half the farms are operated by tenants or sharecroppers. The average annual rainfall at Statesville is 50 in. Thunderstorms are the predominant type of storms during the summer, but winter rains are usually of long duration and low intensity. A reconnaissance survey, made in 1934, showed 39 percent of the area to be moderately to severely eroded and 29 percent more to have suffered appreciable erosion. Out of the total area damagd by erosion, 18 percent was affected by gullying and 3.35 percent of the total land area had been abandoned because of erosion. Investigations into the causes and consequences of erosion and methods for its control were conducted on plots of various sizes, fields, and terraced and natural watersheds. Meteorological records were kept of the amount, duration, and intensity of each individual storm.

Control plot studies showed that runoff and soil losses were directly related to rainfall intensity, but the magnitude of loss was modified by such other factors as soil type, soil moisture, state of cultivation, degree and length of slope, and extent of protective cover on the soil. Runoff and soil losses under good vegetal cover composed of sod or woods were of negligible quantities throughout the period of record. Burning of woods litter increased runoff and soil losses to seriously large quantities. A 4-yr. rotation of cotton, corn, wheat, and lespedeza decreased the soil losses to less than one-half that of continuous cotton. Cotton in the rotation lost 70 percent and lespedeza but 4 percent as much soil as continuous cotton. The reduced soil losses from areas under crop rotations demonstrate the protective effects of crop cover and organic residue for land planted to row crops. Little difference was recorded in the runoff and soil losses from desurfaced and normal topsoil plots cropped to continuous cotton. Fertilizer applications annually, and a 2-yr. rotation of cotton and corn in which cowpeas were included, reduced soil losses on the desurfaced plots to approximately one-half that of continuous cotton on desurfaced soil.

A comparison of terraces of different lengths shows that the soil and water losses were practically the same for the 1,700- and 2,000-ft. lengths but considerably less for the 1,400-ft. length. Results from terraces with different vertical intervals indicate that, for best results, the intervals should be approximately 4 ft. For the experimental field F, with land slope of 8–10 percent and a channel grade of 3 in., the losses decreased when the interval was reduced to 2 ft., but increased when the interval was increased to 6 ft.

Terrace B–5, with a 6–in. uniform grade, lost approximately 3 times as much soil and 50 percent more water than B–4 with a uniform grade of 3 in. Terraces D–3, with 6-in. grade, and D–2, with a 9-in. grade, lost decidedly more soil and water than those with 3-in. grades. Terrace D–4, with a variable grade of 0–6 in., and D–3, with a uniform grade of 3 in., showed about the same losses. A terrace with 6-in. uniform grade showed 20 percent greater soil loss than the variable grade of 0–6 in. Terrace profile studies indicate that maintenance practices have tended to shift the ridge up the slope to a slight extent.

The results of experiments conducted on the station farm are interpreted in terms applicable to the central Piedmont area.

Some factors affecting the establishment of perennial grass for erosion control in eastern Colorado, J. L. Fults. (U. S. D. A. coop. Colo. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 615–625, illus. 4*).—Although the method of planting seed in prepared covers of sorghums is valuable as a stabilization practice on large critical areas, the author feels that whenever plantings could be made with reasonable safety on clean or fallowed land this method can be expected to produce grass stands in less time than plantings in any kind of "prepared" or weed cover. Under favorable moisture conditions, it should be possible to use fallow in those areas of heavy soils where fallow has been a part of the regular wheat, fallow, wheat or sorghum, fallow, wheat rotations. August grass plantings on land clean fallowed with deep furrow cultivation equipment during May, June, and July, or plantings on land kept fallow by the "stubble-mulch' method, appear to be possible solutions. In the regrassing of areas now under cultivation, the procedure should depend on the physical characteristics of the land and on how soon a stand of desirable grass is wanted. Progressive, annual retirement and the use of strip cropping, strip reseeding, contour furrows, and terraces over a period of 3–5 yr. are believed to offer certain definite advantages of soil protection, moisture conservation, and probability of success. The choice of method for regrassing areas which have a cover of weeds will depend on conditions the same as those for land now in cultivation, and, in addition, on the growth form of the weed cover. The chances of direct reseeding are believed good on heavy soils with a weed cover of low-growing Russian-thistles, provided there has been but little soil accumulation from recent duststorms. It appeared of little use to tear out a weed cover to grow a preparatory sorghum or other crop cover in which to plant. When moisture and temperature are favorable, plantings of 0.5 in. or less are more successful than deep plantings. Although depth of planting is often a deciding factor in emergence, it becomes less and less important as time goes on and a stand is established, especially in the use of such sod-forming grasses as western wheatgrass and buffalo grass. Favorable moisture conditions were also of greater significance than whether plantings were made in the spring or fall. This was true of the warm temperature grasses, like the gramas and the buffalo grass, as well as a cool temperature grass, such as western wheatgrass. The total available moisture in the 0- to 24-in. zone at planting time was found to be of more importance in establishment than any extra moisture possibly conserved during and after seedling emergence by a noncompetitive mulch.

The result of mowing grass plantings is determined by the character of the weeds and by the species of grass. In eastern Colorado, the mowing of plantings made in certain types of low-growing Russian-thistles will not often give significant returns either in increased stands or reduction of weeds. Whenever grass mixture plantings containing mid-grasses and short grasses are mowed, a codominance of short and mid-grasses can be expected in the resulting turf. As a rule, pure-stand plantings of blue grama and western wheatgrass are not significantly improved by mowing, but buffalo grass can be expected to be improved in almost every case. Mowing of high weeds, such as a rank growth of upright pigweed, *Amaranthus retroflexus* L., in a wet year may be of some value.

Fish and farms suffer when the Maumee runs brown, T. H. LANGLOIS (*U. S. Dept. Agr., Soil Conserv., 10* (*1944*), *No. 1, pp. 6–8, 15, illus. 6*).—The lands here discussed were under swamp forest cover when first developed (about 1850) for agricultural use by clearing and by drainage of the swamp waters into the Maumee River. These lands were once the bed of a glacial lake and are so nearly level that extensive ditch and tile drainage is necessary. Crops are very good but cropping practices are such that they leave the soil without cover during critical rainfall periods, and it is stated that a huge loss of some of the richest soil in our country is occurring. The resulting sedimentation of the west end of Lake Erie has seriously interfered with the continued growth of aquatic vegetation and thus in turn with maintenance of the commercial catch of food fishes. Improved drainage methods such as turfing of ditch banks and stream banks, etc., and improvements in cropping practices are discussed.

Sedimentation in a great harbor, L. C. Gottschalk (*U. S. Dept. Agr., Soil Conserv., 10 (1944), No. 1, pp. 3–5, 11–12, illus. 3*).—The history of the sedimentation of Baltimore Harbor is outlined from the time of the first white settlement to present-day conditions. The sedimentation of a succession of reservoirs serving the same city is also discussed.

"Preliminary studies in the Patapsco River watershed indicate that approved conservation practices such as gully control, strip cropping, stream-bank protection, terracing, contour plowing, crop rotation, and other measures, which can be fitted into the farm economy, would result in a substantial reduction of dredging costs in the harbor as well as very large benefits to the farmers and landowners. The sediment inflow to Baltimore Harbor is conservatively estimated to be about 600,000 cu. yd. annually. About 90 percent of this is derived from approximately one-third of the drainage area, mostly from the cultivated land. The total installation cost of erosion-control measures in the sediment source areas, plus maintenance for 25 yr., is estimated to be about $750,000. With a well-planned and carefully executed program, it is estimated that the sediment inflow from this area could be reduced by nearly 75 percent, which, at prevailing contract dredging costs, would amount to a savings of $60,750 annually to the Federal Government alone. On the basis of benefits received solely from reduced dredging costs, this program, which should require no longer than 5 yr. to complete, would pay for itself in a little more than 12 yr. from date of completion. Over a period of 25 yr. it would not only pay for itself but would save the Government three-quarters of a million dollars besides." These benefits are in addition to those affecting the farm lands to be protected from soil losses.

Further experiments to determine the organisms responsible for decomposition of cellulose in soils, C. E. Skinner and E. M. Mellem (*Ecology, 25 (1944), No. 3, pp. 360–365*).—On adding finely divided filter paper to acid soils, 60 percent saturated with water, with or without nitrates, no evidence was found of the activity of cellulose-decomposing bacteria, although mold growth increased greatly. In soils with an initial pH above 5.0, both molds and cellulose-decomposing bacteria showed a significant increase. The conclusion of Dubos (E. S. R., 59, p. 717) that both aerobic bacteria and molds take part in the decomposition of cellulose in nonsaturated soils, unless they are distinctly acid, is shown to be correct.

The occurrence and distribution of algae in soils, F. B. Smith. (Univ. Fla.). (*Fla. Acad. Sci. Proc., 7 (1944), No. 1, pp. 44–49*).—Norfolk fine sand, Orangeburg fine sandy loam, Bradenton fine sandy loam, and Muskingum stony loam were used in the investigation. The list of species of algae is presented for each soil studied. While certain forms are widely distributed in soils, the different soil types were found to have a characteristic algal flora, or, at least, soil type differences were apparent.

Three decades with soil fungi, S. A. Waksman. (N. J. Expt. Stas.). (*Soil Sci., 58 (1944), No. 2, pp. 89–115, illus. 6*).—The author here reviews 30 yr. of the work of the department of soil microbiology ot the station, beginning with his own first experiments to ascertain whether or not fungi are capable of growing and produce a mycelium in a normal soil. Under the head of problems considered, a caption which covers the principal content of the review, there are taken up the following topics: Do fungi produce vegetative mycelium in the soil; enumeration of fungi in the soil; nature of the fungus population of the soil; biochemical activities of fungi and their bearing upon soil processes; associative and antagonistic effects of soil fungi; fungus population of the soil in relation to growth of higher plants; miscellaneous problems on the occurrence and activities of fungi; and role of fungi in soil processes and in plant nutrition.

The nitrogen and mineral contents of sugar beet sections, C. T. Hirst and J. E. Greaves. (Utah Expt. Sta.). (*Soil Sci., 58 (1944), No. 1, pp. 25–34, illus. 3*).—The average content of nitrogen in the tops and crowns of the beets produced on 1 acre with manure or ammonium sulfate was 64.6 lb. This nitrogen, at 15 ct. a pound, would cost $9.69. The average nitrogen content in the tops and crowns on the nonmanured plots not fertilized with ammonium sulfate was 27.6 lb. (cost in reduced soil fertility, $4.14). The percentages of phosphorus were considerably lower in the beets than in the leaves. The phosphorus content of all sections of the sugar beet plant was increased by manure and phosphorus fertilizer, the average number of pounds of phosphorus in the leaves and tops of beets produced on 1 acre with manure and phosphorus fertilizer being 4.8 and in nonmanured, nonphosphorus-fertilized beets 1.9 lb. The commercial fertilizer cost of either would be small. The percentages of calcium and magnesium were greatest in the leaves and least in the beets. The quantity in the crowns was greatest next to the leaves and decreased as the distance from the leaves increased. The beet leaves contained approximately 30 percent of the total moist weight, 65 percent of the total nitrogen, and 50 percent of the total phosphorus.

The nitrogen content of crowns and leaves computed to the dry basis approximates that of first crop alfalfa, and feeding tests have indicated that the coefficient of digestibility compares favorably with that of alfalfa. Other feeding tests cited have shown that 1 ton of moist beet tops and crowns approximates 14 lb. of shelled corn and 72 lb. of alfalfa in feeding value. The phosphorus content of the leaves and crowns of sugar beets is lower than that of alfalfa, and it is held highly probable that their nutritive value would be increased by a phosphorus supplement.

Noxious nitrogen in leaves, crowns, and beets of sugar beet plants grown with various fertilizers, C. T. Hirst and J. E. Greaves. (Utah State Agr. Col.). (*Soil Sci., 57 (1944), No. 6, pp. 417–424, illus. 1*).—Although they do not consider their results conclusive, the authors feel that their data point to the conclusion that fertilizers increase the noxious nitrogen of the various sections of the plant. The total quantity of noxious nitrogen contained in the beet sections, produced on 1 acre of soil, varied from 0.4 lb. in the best crowns to 11 lb. in the beets, as an average. The leaves carried an average of 10 lb. These values varied widely, depending on the fertilizer treatment. The percentages of total nitrogen occurring as noxious nitrogen in the various sections of sugar-beet plants varied from 28 in the top crown section to 35.7 in the leaves.

Beet crowns and leaves, because of the quantities of betaine which they contain, probably have special nutritive value when fed to hogs, beef cattle, sheep, chickens, and turkeys; but the betaine content may unsuit them as feed for milk cows.

Phosphorus fixation by the coarse and fine clay fractions of kaolinitic and montmorillonitic clays, R. Coleman. (Miss. Expt. Sta.). (*Soil Sci., 58 (1944), No. 1, pp. 71–77, illus. 3*).—Phosphorus fixation by hydrogen- and ammonium-saturated coarse and fine clay fractions of Susquehanna clay loam and Orangeburg sandy loam was determined at various reactions both before and after the free iron and aluminum oxides were removed.

All of the phosphorus held by the coarse clay and most of the phosphorus held by the fine clay was fixed by the free iron and aluminum oxides. Kaolinite and montmorillonite in the fine clay fixed appreciable quantities of PO_4, but the kaolinite, montmorillonite, quartz, and mica in the coarse clay minerals did not fix phosphate. Phosphorus fixation by both coarse and fine clays is influenced by reaction and exchangeable cations only in the presence of the free iron and aluminum oxides. The coarse clays, containing about one half as much free iron and aluminum oxides as fine clays, fixed about one half as much PO_4. The amount of PO_4 fixed by clay was influenced less by the type of clay mineral than by the content and activity of the free iron and aluminum oxides.

Phosphate studies.—II, Chemical availability of phosphorus in various organic and inorganic carriers, as indicated by the Neubauer test, V. E. Spencer and F. M. Willhite. (Nev. Expt. Sta.). (*Soil Sci., 58 (1944), No. 2, pp. 151–161, illus. 1*).—"Chemical availability" is adopted as a substitute term for "availability," to exclude the "positional availability" found by the authors of the preceding paper (E. S. R., 72, p. 452).

Neubauer tests (E. S. R., 53, p. 319) of one soil treated with 4 organic and 11 inorganic phosphates, and of several soils each treated with 1 inorganic and 1 organic phosphate, showed the chemical availability of the phosphorus in 9 of the 11 organic carriers to be quite as high as that in any of the inorganic carriers.

Fused tricalcium phosphate: Relation of degree of defluorination to fertilizer value of quenched fusions of rock phosphate, W. H. MacIntire, S. H. Winterberg, B. W. Hatcher, and G. Palmer. (Tenn. Expt. Sta.). (*Soil Sci., 57 (1944), No. 6, pp. 425–442, illus. 8*).—The P_2O_5 availability of quenched fusions of brown rock phosphate was determined as solubility in ammonium citrate and in carbonated water by Neubauer tests and by crop response and P_2O_5 recovery in pot cultures. An 80-percent removal of initial fluorine content appeared necessary to a satisfactory increase in fertilizer value. X-ray diffraction patterns demonstrated that a substantially defluorinated and quenched fusion of rock phosphate is composed chiefly of the readily available alpha form of tricalcium phosphate. The findings indicated that a quenched rock phosphate fusion carrying not more than 0.4 percent fluorine and of 100-mesh fineness is satisfactory for incorporation with neutral soils, those mildly acidic, and those treated with limestone or dolomite sufficient for the growing of red clover. Substantially defluorinated and quenched fusions finer than 50-mesh are believed to be also suitable for such use.

The potassium-supplying powers of 20 New Jersey soils, F. E. Bear, A. L. Prince, and J. L. Malcolm. (N. J. Expt. Stas.). (*Soil Sci., 58 (1944), No. 2, pp. 139–149*).—The capacity of the A horizons of 20 important New Jersey soils to yield their reserve K to the alfalfa plant was investigated. The alfalfa was grown through seven successive crops under greenhouse conditions in which the experimentally designed limiting factor, in the first series of pots, was a lack of K. This deficiency was partly or totally eliminated in the second and third series of pots by applications of KCl equivalent to 100 and 200 lb. K_2O, respectively, per acre. The total and exchange K were determined on the soils as they came from the field and after the seven crops of alfalfa had been harvested. Potassium was determined in the crops as harvested and in the roots at the end of the test. The Ca and Mg contents of the soil exchange-complex and of the harvested crops were also determined. From these data, calculations of the amounts of K released by the several soils during the course of the experiment were made.

The data verified the previously known fact that the most reliable index to the capacity of a soil to supply K to the crop is not its total content of the element, but the quantity that exists in the exchange form. It was shown, however, that the soils studied vary greatly in their capacity to renew the exchange supplies from their reserves of K. Some soils, of which Chester loam was the best example studied, continued to release much K throughout the period of the test. Other soils, of which Papakating stony loam was outstanding, were in greater need of fertilizer K than would have been expected from a knowledge either of their total or of their exchange supplies of the element. Some factor or factors other than a lack of K limited the growth of alfalfa on 15 of the 20 soils. The yields of the lowest-producing soils could not be raised to 50 percent of those harvested from the most productive, when K, the supposedly limiting factor, was supplied in what was believed to be adequate quantities. Lakewood sand, Whippany silty clay loam, Sassafras sand, Gloucester loam, and Papakating stony loam had the greatest need of K, and Dutchess shale loam, Bermudian silt loam, Dover loam, Penn silt loam, and Collington loam, the least, the other 10 soils occupying intermediate positions.

Potassium response of various crops on a high-lime soil in relation to their contents of potassium, calcium, magnesium, and sodium, C. A. Bower and W. H. Pierre. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 608–614*).—The K response of seven different crops grown on a K-deficient high-lime soil of the Webster series was determined in the greenhouse, at two rates of K fertilization. The crops were analyzed for K, Ca, Mg, and Na.

Large responses to K fertilization were obtained with corn and sorghum, whereas only slight to moderate responses were obtained with flax, oats, and soybeans. Sweetclover gave no response and that of buckwheat was negative. Of the various crops studied, only flax and oats absorbed Na appreciably. It is believed that these crops respond but little to K fertilization because the Na which they absorb substitutes for K in the plant and thereby lowers the crop demand for K. With regard to those crops which absorb little Na, it was found that their K responsiveness on the high-lime soil studied varied with their normal contents of Ca and Mg in relation to K. Sweetclover and buckwheat, which gave no K response, are crops which ordinarily use large quantities of Ca and Mg in relation to K, whereas the highly responsive crops, corn and sorghum, normally use small quantities. Soybeans occupy an intermediate position as regards K response and contents of Ca and Mg.

These results are explained on the hypotheses (1) that K absorption by crops on high-lime soils is repressed by high concentrations of Ca and Mg in the soil solutions, and (2) that those crops which require considerable amounts of Ca and Mg for normal growth show low response to K fertilization because they lower the ratios of Ca and Mg to K in the soil solution sufficiently to reduce or remove the repressive effects of Ca and Mg on K absorption.

Prevention of calcium carbonate precipitation in soil solutions and waters by sodium hexametaphosphate, R. F. Reitemeier and M. Fireman. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 1, pp. 35–41, illus. 1*).—Alkaline soil solutions and waters containing appreciable concentrations of calcium and bicarbonate ions were found to be stabilized against the precipitation of calcium carbonate by the addition of 2 p. p. m. of sodium hexametaphosphate. The storage of such solutions for analysis or for long-time soil experiments is thereby facilitated.

This concentration of the metaphosphate in percolation waters apparently has no effect on the permeability and base status of a soil, as demonstrated by laboratory permeability studies and exchangeable base determinations. Much higher concentrations of metaphosphate cause an increase in adsorbed sodium and a corresponding decrease in permeability by virtue of the ability of the metaphosphate to form stable soluble complexes with calcium.

The turmeric determination of water-soluble boron in soils of citrus orchards in California, A. R. C. Haas. (Calif. Citrus Expt. Sta.). (*Soil Sci., 58 (1944), No. 2, pp. 123–137, illus. 1*).—If the original commercial alcohol was stored in the Pyrex bottle for prolonged periods, the distilled product was unsatisfactory, and the more so the longer the previous storage in Pyrex. The purity of the alcohol for the tumeric suspension and the quality of the paper for its filtration (unless centrifuging is used) require special attention. Satisfactory results were obtained when the temperature of the bath used for obtaining the colored residue was electrically controlled and the period for evaporation held constant. The importance of including a blank with every set of unknowns is pointed out.

Clear filtrates of cool soil suspensions were readily obtained without rewarming the suspensions. Ignition of the organic matter in filtered soil suspensions was carried on at low temperatures without appreciable loss of boron and did not interfere with the satisfactory recovery of small amounts of added boron. The heating of soil suspensions brought into solution more boron than that found in unheated suspensions kept for a similar period. The long standing of suspensions which had been heated and cooled did not lower the soluble boron to the level of that of unheated suspensions. The oven drying of air-dried soils or of rewetted air-dried soils that were again air-dried caused little change in the water-soluble boron content in some soils and considerable change in others. The degree of cooling of heated soil suspensions before filtration materially affected the water-soluble boron values obtained in some instances. As dilution in the soil suspensions increased, the water-soluble boron (air-dry soil basis) increased.

The application of sulfur to orchard soil resulted in increased water-soluble boron even after a lapse of 10 yr. An Aiken soil from olive and citrus areas near Oroville showed no increased boron solubility when acid was used instead of distilled water in making the soil suspensions, and yet the olive trees alone have thus far responded to the application of boron to the soil. Other citrus soils near Oroville were found to contain large amounts of water-soluble boron. Some of the citrus soils of California showed a decreasing water-soluble boron content with increasing depths, but in relatively few was there an increase with increasing depths. In most there was no definite trend. Citrus soils in California were found to be generally well supplied with water-soluble boron, and in certain areas the concentrations were excessive.

The fixation of added boron by Dunkirk fine sandy loam, R. Q. PARKS. (U. S. D. A.). (*Soil Sci., 57 (1944), No. 6, pp. 405–416, illus. 6*).—The Dunkirk soil used was collected from the surface 6 in. of an experimental field near Ithaca, N. Y. After being dried and mixed, a portion of the soil was used without further treatment and the remainder extracted repeatedly with 0.05 N HCl (10 l. of 0.05 N HCl having been added to 25 lb. of soil), and then repeatedly with distilled water. In soft-glass tumblers, 125-gm. samples of the normal and of the acid-washed soil were treated with solutions containing the equivalent of 0, 1, 5, 25, 75, and 200 lb. of borax per acre. The samples were then dried at varying temperatures. After drying, the samples were saturated with 40 cc. of distilled water and dried again. In certain series as many as 24 such drying cycles were carried out. Each sample was removed after every third drying cycle, rolled, mixed, and replaced in the tumbler. Extractable boron was determined on duplicate samples of soil from each tumbler. Fixation of added boron varied from none to almost complete fixation with increase in number of drying cycles. Increase in temperature of drying from 26° to 85° C. almost doubled the amount of boron fixation. Lime added with boron or before boron additions strikingly decreased the fixation capacity of the soils for boron. At the lower levels of boron supply, percentage fixation increased as boron concentrations increased.

The results are discussed in the light of the work of other investigators. It is concluded that the data obtained tend to support the mechanism of boron fixation by entrance into the clay crystal lattice more than fixation by chemical precipitation, absorption by clay or organic matter, or microbiological fixation.

Soil fertilizers: Their application and function on soils in Alaska, D. L. IRWIN (*Alaska Sta. Cir. 5 (1944), pp. 11*).—A discussion of the function, need, and recommended usage of fertilizers for various crops.

Barnyard manure: Its value and use in Alaska, D. L. IRWIN (*Alaska Sta. Cir. 2 (1944), pp. 5*).—A general information circular on the conservation and value of barnyard manure.

Inspection and analysis of commercial fertilizers, H. J. WEBB (*South Carolina Sta. Bul. 348 (1943), pp. 138+*).—The 1942–43 inspection data are presented, with the customary analyses.

AGRICULTURAL BOTANY

Early American publications relating to bacteriology.—I, Textbooks, monographs, addresses, etc., L. S. McClung (*Bact. Rev., 8 (1944), No. 2 pp. 119–160*). —"The Committee on Archives of the Society of American Bacteriologists is endeavoring to collect regional histories of the beginnings of bacteriology in America. . . . As a possible aid in this program, a compilation has been made of certain publications that have appeared during the early years (through 1915)." Included in this installment are an annotated alphabetical list of authors and the titles of their works and a chronological list of authors.

Bacteria and rural water supplies, J. E. Fuller (*Massachusetts Sta. Bul. 414 (1944), pp. 20*).—"This is an attempt to give intelligent direction to what constitutes sanitation in rural water supplies" and is based largely on experiments described in detail which were conducted over several years to determine to what extent positive laboratory tests actually mean dangerous pollution and how rigidly the "Standard Methods" procedure and interpretation should be adhered to in evaluating the sanitary quality of water from farms and other rural supplies. On the basis of experience and the studies reported, it is concluded that the results of tests of untreated private supplies must be interpreted liberally and emphasis placed on the presence of the colon bacillus rather than on the aerogenes bacillus or intermediates of the coliform group. It is desirable where possible to have a sanitary survey of the source of the water tested. Studies of the several media for the presumptive and confirmation tests failed to find any substitutes for the media specified in the Standard Methods for these purposes. Certain intangible values were also derived from the study which are not easily set down on paper—experience and a capacity for judgment that have proved of substantial value in the doing of the work. Pertinent literature (21 references) is reviewed.

The use of alfalfa extract to supply nutrients for the growth and chemical activities of Acetobacter suboxydans, E. I. Fulmer, A. C. Bantz, and L. A. Underkofler (*Iowa State Col. Jour. Sci., 18 (1944), No. 4, pp. 369–376*).—Extracts of alfalfa prepared by heating alfalfa meal with water or with dilute HCl or NaOH under various conditions supported the growth of *A. suboxydans* satisfactorily, though not as well as yeast extract; best results were obtained with an acid extract. A procedure is described for preparing a dry material from the alfalfa extract; growth of the organism on a nutrient prepared from the best dry preparation approached that on an equal weight of yeast extract. The yields of keto-compounds from the polyhydric alcohols, glycerol, sorbitol, and 2,3-butylene glycol were the same when yeast or alfalfa extracts were used as nutrients.

The fermentability of the stereoisomeric 2,3-butanediols by Acetobacter suboxydans, L. A. Underkofler, E. I. Fulmer, A. C. Bantz, and E. R. Kooi (*Iowa State Col. Jour. Sci., 18 (1944), No. 4, pp. 377–379*).—The authors demonstrated that *A. suboxydans* oxidizes *meso*-2,3-butanediol and *l*-2,3-butanediol to acetylmethylcarbinol, but fails at attack the *d*-2,3-butanediol. This is another example of the biochemical specificity of living organisms toward one of a pair of enantiomorphs.

Fermentations by streptothricin-resistant cultures of Aerobacillus polymyxa, D. Perlman. (Univ. Wis.). (*Jour. Bact., 48 (1944), No. 1, pp. 116–117*).

Streptomycin, a substance exhibiting antibiotic activity against gram-positive and gram-negative bacteria, A. Schatz, E. Bugie, and S. A. Waksman. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 66–69*). —Although most of the antibacterial agents produced by actinomycetes are active against gram-positive bacteria, certain few of them also exert a marked selective activity against many of the gram-negative types. *Actinomyces lavendulae,* producer of streptothricin, is such an organism. After detailed examination of a large number of cultures from soils and composts, another organism morphologically and culturally resembling *A. griseus* was found that produces an antibiotic apparently combining many of the desirable antibacterial properties; because of its similarity to streptothricin it is here designated "streptomycin." The two substances differ, however, in the nature of their bacterial spectra as well as in their quantitative action on different bacteria. It is suggested that they are closely related chemical compounds.

An experimental study of alternation of generations in Allomyces arbusculus, W. R. HATCH and R. C. JONES. (Wash. State Col.). (*Mycologia, 36 (1944), No. 4, pp. 369–381*).—From experimental results reported it is concluded that drying and nutrition affect the sexual-asexual ratio of the products of resistant sporangia. The suggestion is made that the common practice of drying resistant sporangia for several weeks before inoculating into water or weak nutrient cultures may have been largely responsible for the fact that the products of such sporangia have heretofore been reported as preponderantly sexual.

A species of Arthrobotrys that captures springtails, C. DRECHSLER. (U. S. D. A.). (*Mycologia, 36 (1944), No. 4, pp. 382–399, illus. 6*).—Of the predaceous fungi—numbering about 61—that have been made known both with respect to the vegetative stage active in capturing animals and to at least one reproductive phase sufficiently distinctive to provide a basis for identification, 3 are recognized as preying mainly on rotifers, 5 on testaceous rhizopods, 24 on amebas, and 29 on nematodes. The present contribution reports on a hyphomycetous fungus described as *A. entomopaga* n. sp., which is unmistakably adapted to prey primarily on insects and under natural conditions is presumably given wholly to a predaceous mode of life. The springtail parasitized was identified as *Sminthurides* sp.; occasionally various nematodes were also found destroyed by the fungus.

A new species of Metarrhizium active in decomposing cellulose, S. POPE. (U. S. D. A.). (*Mycologia, 36 (1944), No. 4, pp. 343–350, illus. 2*).—*M. glutinosum* n. sp. is described; it was isolated from deteriorated baled cotton in storage.

Saccardo's confusion of the spermatial stage of S[clerotinia] duriaeana and S. curreyana with the Sphacelia stage of Claviceps nigricans, H. H. WHETZEL. (Cornell Univ.). (*Mycologia, 36 (1944), No. 4, pp. 426–428*).

Fusarium-Monographie.—II, Fungi parasitici et saprophytici [Monograph on the Fusaria.—II, Parasitic and saprophytic species, varieties, and forms], H. W. WOLLENWEBER (*Zentbl. Bakt. [etc.], 2. Abt., 106 (1943), No. 8–10, pp. 171–202, illus. 27*).—A taxonomic treatise of the group, including descriptions and synonymy.

Notes on the Ustilaginales of the world, III, IV, G. L. ZUNDEL. (Pa. State Col.). (*Mycologia, 35 (1943), No. 2, pp. 164–184, illus. 4; 36 (1944), No. 4, pp. 400–412*).—Included in these installments (E. S. R., 87, p. 381) are species of *Ustilago, Sphacelotheca, Cintractia, Farysia, Mycosyrinx, Sorosporium, Glomosporium, Tranzschelia, Polysaccopsis, Melanopsichium, Tilletia, Urocystis, Entyloma,* and *Doassansia,* in the majority of cases involving new taxonomy.

Flora of Alaska and adjacent parts of Canada: An illustrated descriptive text of all vascular plants known to occur within the region covered.—Part II, Typhaceae to Poaceae, J. P. ANDERSON (*Iowa State Col. Jour. Sci., 18 (1944), No. 4, pp. 381–445, illus. 132*).—A second installment of the manual previously noted (E. S. R., 90, p. 166).

Use of terms relating to vegetation, A. G. VESTAL. (Univ. Ill.). (*Science, 100 (1944), No. 2588, pp. 99–100*).—The recently increased and unprecedented awareness of vegetation renders timely any discussion leading to a more accurate use of names for certain vegetation types. The author makes certain suggestions regarding the terminology of plant cover data.

Natural revegetation of abandoned plowed land in the mixed prairie association of northeastern Colorado, D. F. Costello. (U. S. D. A.). (*Ecology, 25 (1944), No. 3, pp. 312–326, illus. 5*).—Plant succession under these conditions proceeds through an initial stage characterized by *Salsola kali tenuifolia, Amaranthus retroflexus, Chenopodium album,* or other annuals; a forb stage consisting of a large variety of annual and perennial forbs and a few grasses; a short-lived perennial grass stage in which *Schedonardus paniculatus, Hordeum jubatum, Sporobolus cryptandrus,* or *Sitanion hystrix* are usually abundant; a stage marked by dense stands of *Aristida longiseta* or *A. purpurea;* and the fully developed mixed prairie association, consisting of a mixture of short grasses, midgrasses, forbs, and shrubs. In relatively undisturbed successions, the initial stage lasts 2–5 yr., the forb stage 3–6, the short-lived perennial stage 4–10, and the *Aristida* stage 10–20 yr. The transition to climax mixed prairie may require 10–20 yr. Drought cycles and wet years retard or accelerate the rate of succession. Other factors markedly influencing the rate of succession are topography, intensity and duration of cultivation preceding abandonment, and grazing. Succession is accompanied by an increase in complexity of the floristic composition. Influents of considerable importance include kangaroo rats, jack rabbits, and harvester ants. The small mammals tend to reduce seed production of the midgrasses. Ants probably affect the seed supply, and their mounds provide a substratum for the entrance of short grasses into the succession.

Wild rice in Minnesota, J. B. Moyle (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 177–184*).—The State contains over 15,000 acres of wild rice (*Zizania aquatica*) growing in shallow lakes and along streams in the northern and central parts. This native grain exhibits considerable variation in size and number of kernels per head as well as in other characteristics; it tends to develop local strains. The crop, in addition to its value for waterfowl, provides an average annual harvest of about 500,000 lb. of processed rice. Up to 2,500 persons—about a third of Indian blood—engage in the harvesting, and the grain usually has an annual value of $100,000 to $400,000. On any stand the harvest averages failure 1 yr. in 4, the principal cause being a high water level during May-June. Sufficient grain for reseeding is usually produced in these years of harvest failure. The limited data available suggest that often as little as a tenth of the crop on a stand is taken by hand harvesting, most of the grain being left for waterfowl and reseeding. When total production, calculated as processed rice, is below 300 lb. per acre, hand harvesting is usually unprofitable; the average harvest in Minnesota is about 30–40 lb. per acre. Wild rice is more of an attraction than a staple food plant for waterfowl and shows marked preference for certain habitat conditions; unless these conditions are supplied plantings are apt to fail.

The effect of vitamin B_1 on the utilization of glucose by Melanospora destruens Shear, L. E. Hawker (*Ann. Bot. [London], n. ser., 8 (1944), No. 29, pp. 79–90, illus. 1*).—The presence of 10γ aneurin (vitamin B_1) per 100 cc. medium increased the amount of glucose consumed per unit dry matter of mycelium by this fungus. The extra sugar consumed was not stored in the mycelium, and there was no large accumulation in the medium of metabolic products containing C, such as inositol, bicarbonates, or organic acids. The O_2 uptake, and therefore presumably the amount of C respired, per unit dry weight of mycelium was increased by vitamin B_1 sufficiently to account for the extra glucose consumed; a similar result was obtained with *Phycomyces nitens.* Previous accounts of the effects of growth substances on respiration are summarized and discussed (45 references). A correlation between high respiration rate and production of perithecia by *M. destruens* is shown.

Action de la thiamine sur le Phytophthora infestans (Mont.) de Bary, A. Payette and C. Perrault (*Canad. Jour. Res., 22 (1944), No. 3, Sect. C., pp.

127–132, illus. 16; Eng. abs., p. 132).—*P. infestans* appeared to require thiamine, maximum effects being obtained with 2 µg. to 1 cc. of the liquid mineral-dextrose medium containing asparagine and organic acids. In contrast to *Phycomyces blakesleeanus,* used as a control, *Phytophthora infestans* failed to respond to the pyrimidine and thiazole derivatives of thiamine. Inositol in combinations with thiamine at certain concentrations appeared to inhibit somewhat the effect of this substance. A yeast extract preparation, almost ineffective alone, appeared to increase the effect of thiamine.

Bleeding and sap movement, H. Lundegårdh (*Arkiv Bot., 31* (*1944*), *No. 1,* [*Art. 2*], *pp. 1–56, illus. 6*).—Bleeding experiments were conducted with vigorous 15-day-old wheat seedlings grown in nutrient solutions in photothermostats under special care to maintain good aeration and fresh bleeding surfaces. The bleeding sap contained no carbohydrates or proteins. The inorganic anions and cations predominated and were present in about equivalent amounts, but under special conditions (e. g., anaerobiosis) the metallic cations considerably exceeded the anions. It is concluded that under these conditions CO_2 and HCO_3 invade the sap, which has a pH of about 6. The composition of the sap was influenced by that of the medium; e. g., in nutrient solutions containing nitrate, NO_3 and K predominated in the sap, in phosphate solutions the PO_4 in the sap rose, and in solutions without nitrate Cl was present. The average intensity of bleeding in dilute solutions was about proportional to the concentration of anions in the sap. The nitrate concentration in the sap exceeded the average nitrate concentration in the total root system; on the contrary, the average content of K was much greater in the tissue. When the bleeding was retarded by osmotic counterpressure in the medium or by choking of the vessels at the place of decapitation the osmotic value of the sap rose. The bleeding is an aerobic process but does not stop immediately after exclusion of O_2 or poisoning with HCN. The time course of bleeding varied with different solutions; it is concluded that the presence or absence of certain ions or of O_2 influenced the permeability of the cortex to the movement of water. Chemical analysis of the guttation fluid of 15-day-old plants indicated a lower NO_3 concentration than in the bleeding sap, but a large content of sugar and other organic compounds. No close proportionality was found between the rates of ion absorption and exudation. Exudation into the sap occurred independently of absorption as long as the excess of salts (nitrate) in the tissue persisted.

As regards theoretical conclusions, it is believed that bleeding is primarily an osmotic phenomenon. Owing to the great permeability to water and the complete saturation of the roots investigated, the cells of the parenchyma fail to develop any free suction force. In the central vessels of a decapitated plant the suction force is equal to the osmotic pressure of the sap minus that of the medium, and independently of the osmotic value of the parenchyma. In an intact plant the vessels are more or less closed in their upper extremities and a certain turgidity arises. The exudation is believed to be a counterpart to the absorption process in the surface of the root. Both processes are linked up with aerobic processes sensitive to HCN. The high efficiency of the osmotic transport of water is believed due to a localization of the exudation process in a protoplasmic membrane of special structure. Anions and water will then be simultaneously moved. The cations are secondarily released from the surrounding tissue. This mechanism would also be able to maintain a limited nonosmotic transport of water, viz, a transport against an osmotic gradient.

There are over two pages of references.

Water relations of root cells of Beta vulgaris, H. B. Currier (*Amer. Jour. Bot., 31* (*1944*), *No. 7, pp. 378–387, illus. 1*).—Through use of methods described, the existence of a discrepancy between the osmotic pressure of cell sap measured plasmolytically v. cryoscopically was verified; this discrepancy varied among several lots of beets differing in age, developmental stage, and conditions of growth. Changes in volume, adhesion of the protoplasm to the cell wall, and systematic errors in method were in no case sufficient to explain the discrepancies found in certain plants. Tests involving plasmolysis of cells in their own sap, equilibrium between living and dead tissue cylinders and sucrose solutions, and freezing point determinations of living and dead tissue as well as of expressed sap substantiated the reality of the discrepancy between the two methods and helped to explain its cause. It is suggested that these discrepancies are related to contamination of expressed sap by liquid held by and expressed from the protoplasm, the discrepancy may be positive or negative depending on whether the contamination is less or more concentrated than the vacuolar sap, the nature of the contaminating protoplasmic sap depends on the state of hydration of the cytoplasm, and where the discrepancy is positive (protoplasmic less concentrated than vacuolar sap) the cells may be in a cold-hardy condition. Evidence for the "secretion" of water by the living protoplasm is questioned. There are 38 references.

Cryoscopy of small amounts of expressed tissue sap, H. B. Currier *(Plant Physiol., 19 (1944), No. 3, pp. 544–550, illus. 4)*.—During an investigation of water relations in root cells of red beet, it became necessary to devise a method whereby osmotic pressure values of 0.5–1 cc. of sap, expressed from small blocks of tissue, could be obtained. The cryoscopic apparatus and procedure here illustrated and described are simple and are said to permit up to six determinations per hour.

Bibliography of references to the literature on the minor elements and their relation to plant and animal nutrition, L. G. Willis (*New York: Chilean Nitrate Ed. Bur., Inc., 1943, 3. ed., Sup. 4, pp. 92+; 1944, 3. ed., Sup. 5, pp. 96+*).—Fourth and fifth supplements to the third edition (E. S. R., 87, p. 491).

Effects of limiting ions on the absorption of nutrients by wheat, D. Rose and A. G. McCalla (*Canad. Jour. Res., 22 (1944), No. 3, Sect. C, pp. 87–104, illus. 4*).—Wheat grown in culture solutions limited in 1 or 2 nutrients was analyzed for N, P, S, K, Ca, and Mg. Limiting the N reduced plant size and the weight of all nutrients absorbed except P; percentages of P and S increased. Limiting Ca had the least effect on nutrient uptake. Limiting K had no effect on percentage of anions but decreased the total weight absorbed. The percentages of Ca and Mg were increased, while the weight of Ca was increased in one series. Though limiting N and Ca had marked effects on the ratios of various ions absorbed, the total anion : cation ratio was not affected; limiting K, however, caused an increase in this ratio.

Studies on the metabolism of cereal grains, I-III, W. Leach (*Canad. Jour. Res., 20 (1942), No. 3, Sect. C, pp. 160–168, illus. 6; 21 (1943), No. 10, Sect. C, pp. 289–296, illus. 6; 22 (1944), No. 4, Sect. C, pp. 150–161, illus. 5*).—The following papers are included:

I. *The output of carbon dioxide by wheat grains during absorption of water and germination.*—The respiratory course during the early stages of germination is recorded for a number of varieties of bread and durum wheats. Germination was marked by three consecutive respiratory stages, viz, (1) a slow rate of acceleration in CO_2 output, (2) an increased followed by a decreasing rate, and (3) a final uniform and relatively high rate. Under the conditions used, the water absorption rate apparently did not affect these respiratory stages. The infection of germinating grains by fungi reduced their respiration. Possible physiological explanations of the respiratory stages are discussed.

II. *The effect of age and kernel size on the course of respiration of wheat during early germination stages.*—The author reports on hourly records of CO_2 outputs of wheat samples previously stored for 6, 18, and 30 mo. and then kept at 25° C. (1) in contact with water and (2) in a moisture-saturated atmosphere for 40-hr. periods. The lengths of the previous storage periods apparently had no significant effect on the respiratory activities of the samples. Kernel size, however, had a definite influence as shown by the amount of CO_2 produced per unit weight of grain, kernels of large average size giving a lower output than those of small average size.

III. *The influence of atmospheric humidity and mould infection on the carbon dioxide output of wheat.*—It was found that under the experimental conditions wheat kept at 25° in atmospheres of relative humidities approximating 92–100 percent showed a continuously accelerating rate of CO_2 output. This increased as the relative humidity rose and became more pronounced in wheat from which the germs had been removed than in undamaged grains. Where unlimited absorption of water and germination of the grain was prevented, its CO_2 production was due almost entirely to the respiration of micro-organisms infecting it.

An improved arrangement for the measurement of carbon dioxide output of respiring plant material by the electrical conductivity method, W. LEACH, D. R. MOIR, and H. F. BATHO (*Canad. Jour. Res., 22 (1944), No. 3, Sect. C, pp. 133–142, illus. 5*).—A brief review (11 references) of applications of the electrical conductivity method for estimating CO_2 in respiration measurements is presented, and an apparatus employing this method is described which was designed and constructed for recording the respiratory CO_2 output of plant material. The apparatus comprises an oscillator, amplifier, and vacuum tube voltmeter working in conjunction with a special type of absorption tube. A NaOH solution is used as the absorbing agent. A simple set-up for automatic recording is also described.

The action of fumaric acid and maleic acid on the respiration of wheat roots, H. LUNDEGÅRDH (*Arkiv Bot., 31 (1944), No. 1, [Art. 3], pp. 1–12, illus. 3*).—Fumaric, maleic, and pyruvic acids accelerated respiration (measured as O_2 consumption) in wheat roots. The Szent-Györgyi hypothesis as to a catalytic function of the C_4-dicarboxylic acids is thus not supported. The acids in question are believed to act as links in the "desmolysis" and to be consumed in the course of the process. Observations on the effect of the metallic cations on the combustion of the acids pointed to a regulating influence of the H-ion concentration in the boundary between the medium and the protoplasm. The combustion of the acids is believed to occur in this layer. According to earlier investigations, its pH value is controlled by the medium, viz, by its content of acids and metallic cations.

Light and the elongation of the mesocotyl in corn, L. H. FLINT. (La. State Univ.). (*Plant Physiol., 19 (1944), No. 3, pp. 537–543*).—A series of experiments with corn seedlings gave results interpreted as evidence that up to the time of leaf blade emergence from the coleoptile, when mesocotyl elongation ceased irrespective of light conditions, this elongation was retarded by blue but unaffected by red light.

The effect of environmental factors on the development of root hairs in Phleum pratense and Sporobolus cryptandrus, R. G. H. CORMACK (*Amer. Jour. Bot., 31 (1944), No. 7, pp. 443–449, illus. 11*).—The development of root hairs in timothy grass proved similar to that previously found by the author in cabbage roots. In the roots of both plants differentiation into long and short cells occurred in the meristem, but the capacity to form hairs was determined by the chemical and physical changes occurring while the cells were elongating. Through the gradual hardening of the cell wall longitudinal elongation is arrested, and because of increasing pressure from within the wall is pushed out at its softest point, invariably at or near the apical end of the cell. At this point elongation continues, but in a new direction, and a long narrow hair results. Confirmatory tests with the roots of sand dropseed showed them to respond to the various experimental solutions in the same manner as timothy roots. The origin and subsequent growth of root hairs in the dropseed roots are described, and an explanation to account for the variable position of the mature hair is discussed.

The effect of lack of oxygen on meiosis in Tradescantia, L. M. Steinitz. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 7, pp. 428–443, illus. 17*).—Study of mitosis in barley seedlings (E. S. R., 90, p. 463) had indicated that absence of O_2 for nonlethal periods may produce cytological aberrations. It remained to determine whether any phase of the chromosome cycle is more sensitive than another and to obtain a quantitative measure of the effects of anaerobic treatment; this phase of the study was made with *Tradescantia.* During meiosis in the microsporocyte, 48 hr. under anaerobiosis resulted in severe injury; 12 hr. of nitrogen treatment induced abnormalities measurable at the end of the treatment and during recovery in air. These abnormalities included lengthening of the prophase and interphase of meiosis; decrease of terminalization of chiasmata at metaphase; formation of chromosome fragments, bridges, lagging chromosomes, and restitution nuclei; induction of irregularities in chromosome distribution; and formation of giant microspores as a result of failure of cytokinesis of the sporocyte. These giant cells degenerated before pollen grain division. The reaction of dividing cells to lack of O_2 indicates that cells undergoing meiosis are much more sensitive than cells in mitosis as determined in the barley experiments. The most sensitive stage of meiosis is prophase, and probably late zygotene and early pachytene. Secondary sensitive stages were found to be metaphase I and interphase.

Veratrine, a new polyploidy-inducing agent, E. R. Witkus and C. A. Berger (*Jour. Hered., 35 (1944), No. 5, pp. 130–133, illus. 2*).—The cytological effects of this substance were found similar to those of colchicine but with a few interesting differences in the mechanism by which polyploidy is induced. Being effective within a much narrower range of treatment than colchicine, it will probably prove less useful as a tool to the plant breeder.

Cell polarity and the development of form in cucurbit fruits, E. W. Sinnott (*Amer. Jour. Bot., 31 (1944), No. 7, pp. 388–391, illus. 10*).—In ovaries of various lines where the relative rates of growth in length and width had been determined, a close relation was found between the orientation of the mitotic axes and the direction of growth of the organ. Where these axes were preponderantly (or nearly so) parallel to the organ axis, growth in length was the more rapid; where mitotic figures were oriented equally in all directions, length and width were equal in growth rates. The orientation of the telophase axis closely approached that of the actual division, but the anaphase and metaphase did so with progressively less exactness, suggesting that the figure at first rotates somewhat but later settles down to its final position. This position seems to be determined by the polarity of the cytoplasmic body of the cell. The establishment of this cytoplasmic body is the first visible expression of the morphogenic control of dimensional growth rates and thus of organic form.

The development of vessels in angiosperms and its significance in morphological research, I. W. Bailey (*Amer. Jour. Bot., 31 (1944), No. 7, pp. 421–428, illus. 9*).—The irreversible phylogenetic trends in the origins and specializations of vessels are so comprehensive and reliable that they are believed to deserve serious consideration in various lines of botanical research. Their significance in the fields of comparative and developmental morphology are here discussed in some detail. There are 32 references.

The strophiole and other seed structures associated with hardness in Melilotus alba L. and M. officinalis Willd., J. N. Martin and J. R. Watt (*Iowa State Col.

Jour. Sci., 18 (1944), No. 4, pp. 457–469, illus. 9).—The so-called strophiole of sweetclover seeds was found to be the place in the hilum where the vascular connection occurs between the seed and the funiculus. At this place the light line and associated structures related to hardness are interrupted by the vascular elements, which afford a passageway to water. The endosperm, consisting mainly of two gelatinous layers, completely envelops the embryo and, owing to its water retention, is well adapted to protect the embryo against excessive water loss and temperature fluctuation. By its force of imbibition it greatly accelerates the water flow into the seed and to all distal parts; by its pressure, exerted in swelling, it plays a major role in opening the seed coat.

Studies of the germination of sweetclover seeds indicated the strophiole to be the natural place of initial water absorption during this process. Seeds naturally soft or softened artificially or by weathering blackened and began swelling first at the strophiole when immersed in osmic acid solution. On the other hand, hard seeds almost without exception showed no blackening at this point until softened by some means, whereupon they behaved as the naturally soft seeds. Samples of hard seeds scarified not too harshly by hand were softened in proportion to the number of seeds with blackening at the strophiole; the effectiveness of scarification thus lay in making the strophiole permeable to water. In seed samples cleaned and scarified by commercial houses, nearly all soft seeds showed blackening and water absorption at the strophiole, though many of them also blackened and absorbed water at various other places where the seed coat had been mutilated by the processing. The coats of soft seeds stored outside deteriorated rather rapidly. Blackening of the micropyle occurred in some seeds, both hard and soft, but no case was observed in which water was absorbed through the micropyle. The cuticularized layer, domes, and light line constituted an almost continuous barrier to water absorption, being interrupted only at the micropyle and strophiole. At the micropyle, the Malpighian layer closes together so tightly that, with associated structures, it renders the region watertight.

GENETICS

Vegetative development of inbred and hybrid maize, M. E. PADDICK (*Iowa Sta. Res. Bul. 331 (1944), pp. 373–399, illus. 12*).—Corn plants of the inbred strains La and Pr and the hybrid strains La × Pr and Pr × La were studied during germination, when the third, fifth, tenth, and fifteenth leaves were unrolling, and at vegetative maturity. The hybrids developed faster, as shown by the speed of initiation of successive leaves and whorls of roots, made greater over-all growth as indicated by much larger immature leaves of comparable position on plants of the same age, and had larger comparable plant parts, e. g., leaf blades, at maturity. Hybrid plants appeared to have excelled also in extent of development, producing from 20 to 22 leaves compared with 18 or 20 for inbreds. Mature hybrid and inbred plants differed most strikingly in leaves formed after the twelfth or thirteenth, which were much heavier, longer, and wider on the hybrids. Since these leaves developed during tassel formation and rapid culm elongation, on the inbred plant they may have been subject to an inhibiting influence not so effective on the hybrid plants. Hybrid vigor appeared as a factor accelerating growth activities of the plant and carrying them beyond a point common in less vigorous inbreds.

Cytogenetic studies with polyploid species of wheat.—II, Additional chromosomal aberrations in Triticum vulgare, E. R. SEARS. (U. S. D. A. coop. Mo. Expt. Sta.). (*Genetics, 29 (1944), No. 3, pp. 232–246, illus. 2*).—Eleven of the 17 of 21 possible nullisomics obtained in Chinese Spring wheat (designated I to XI) were found to involve chromosomes homologous to those of the emmer or tetraploid wheats, while the other 6 (XV to XX) involve chromosomes not represented in the emmers. While all are reduced in vigor to various degrees all mature, and none is completely sterile. Locations of several genetic factors, revealed by the nullisomics, include a factor for red seeds on chromosome XVI, the hooded factor (*Hd*) for recurved awns on VIII, the awn suppressor B_2 on X, and factors for promotion of awn growth on II and XX. The speltoid chromosome, with the factors for pubescent nodes, squareheadedness, and suppression of awns, is IX. The recessive b_1 on chromosome IX, whose dominant allel inhibits awns, also inhibits awns to a small extent. Differences in recovery of nullisomics in frequencies of less than 1 to more than 10 percent in progenies of monosomics depend mainly on elimination of different proportions of the deficient pollen. Apparently about 75 percent of functioning female gametes are deficient regardless of the chromosome concerned. Tetrasomics occurred among offspring of trisomics in frequencies of about 1 to 10 percent. One tetrasome involves chromosome II and compensates almost completely for nullisome XX. Another tetrasome compensates partially for nulli-XVI, and a certain trisome largely compensates for nulli-I. Telocentrics and isochromosomes occurred fairly frequently among offspring of monosomic plants, following misdivision of the univalent chromosome.

Cytological basis for sterility in induced autotetraploid lettuce (Lactuca sativa L.), J. Einset. (New York State Expt. Sta.). (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 336–342, illus. 9*).—Induced autotetraploids exhibit varying degrees of fertility ranging from values as high as those in many natural autotetraploids to complete sterility. Studies of induced autotetraploids of lettuce indicated that partial sterility of these plants is conditioned by two main factors. In about 20 percent of the ovules the meiotic process breaks down and the embryo sac does not develop. In the remaining 80 percent of the ovules, the embryo sacs appear normal but in only a small percentage (0–25 percent) do the pollen tubes reach the sacs and effect fertilization. The similarity of the observed sterility to partial self-incompatability is indicated.

✓ **A new male-sterile mutant in the tomato,** C. M. Rick. (Univ. Calif.). (*Science, 99 (1944), No. 2583, p. 543*).—The labor required in emasculating and pollinating the flowers of the tomato has prevented the economic use of the procedure to obtain the increase in yields due to hybrid vigor. If it were possible to use a male-sterile variety as ovule parent, the need of emasculation would be eliminated. The author describes such a plant found at Davis, Calif., and shows how the character of male sterility behaved in F_1, F_2, and backcross generations. Male-sterile plants may be found occasionally in the field and are noticeable because of their unusual vegetative development.

Lethal and sublethal characters in farm animals: A check-list and proposed numbering system, I. M. Lerner. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 7, pp. 219–224*).—Brief descriptions are presented of the lethal characters in cattle, horses, swine, sheep, chickens, turkeys, and ducks, bringing the descriptions previously presented by Eaton (E. S. R., 78, p. 769) up to date. Proposals for a number system for lethals are presented.

A genetic analysis of recent Thoroughbreds, Standardbreds, and American Saddle horses, D. G. Steele (*Kentucky Sta. Bul. 462 (1944), pp. 27, illus. 8*).—Study of breeding practices followed in the development of stake winners or "poors," arbitrarily selected in these breeds of light horses by methods of Wright and McPhee (E. S. R., 54, p. 324), showed that current breeding practices were similar to those reported for other farm animals. The prejudice against close breeding, particularly in Thoroughbreds, is probably greater than with other farm animals. In all of the breeds, mating of the best to the best is practiced, and meritorious performance should be the basis for retention rather than length of pedigree, which lacks genetic significance. The average interval between generations (11–12 yr.) constitutes a real limitation to selective breeding in these light horses. In Thoroughbreds, the most prolific sires of stake winners produced more than three times as many stake winners as the poors, whereas the most prolific grandsires produced only about one and one-half times as many stake winners as poors, thus showing how quickly the influence of an ancestor decreases in succeeding generations.

Some aspects of fertility in horses raised under western range conditions, S. R. Speelman, W. M. Dawson, and R. W. Phillips. (U. S. D. A. and Mont. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 233–241, illus. 1*).—Certain aspects of fertility of 209 mares bred to 14 stallions and producing 568 foals at the U. S. Range Livestock Experiment Station over a 15-yr. period are presented. Fertility results from different matings of the mares did not seem to be related to years but rather to the fertility of the stallion with which they were mated during the different years. Very young or aged mares had a lower fertility than those of intermediate age. Among the 44 Belgian mares bred, 70.5 percent foaled; 328 grade draft mares, 50 percent; 180 Morgan mares, 72.2 percent; and among 401 grade light mares bred, 60.6 percent foaled. Of the foals born 87.2 percent were weaned.

A comparative study of two biologic and two chemical techniques of pregnancy diagnosis in the mare, D. T. Mayer. (Mo. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 209–214*).—After the third month of gestation, biological tests of the urine for gonadotrophin and two chemical tests of the urine gave positive results for pregnancy on all of 66 mares producing foals at the U. S. D. A. Range Livestock Experiment Station, Miles City, Mont.; U. S. Morgan Horse Farm, Middlebury, Vt.; and U. S. D. A. Animal Disease Research Center, Beltsville, Md. However, in only 96.4 percent of the mares not foaling were the two chemical methods correct, and the biological test was only 85.7 percent accurate on these mares. The blood-serum test was the least accurate of any of the four employed, yielding but 82 percent correct diagnoses in both pregnant and nonpregnant mares.

Hereditary congenital lethal spasms in Jersey cattle, P. W. Gregory, S. W. Mead, and W. M. Regan. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 7, pp. 195–200, illus. 1*).—A new type of hereditary spasm in Jersey cattle was found to occur in several herds using bulls related to a single herd of high-producing purebred Jerseys. The spasmodic condition was inherited as a recessive autosomal lethal. Affected animals died within a few weeks. Four of five sires in two herds progeny tested for the defect proved to be heterozygous. The gene was evidently present in the stock for 10 or more generations. The breeder who had used three heterozygous sires in succession during almost 12 yr. increased the frequency of the defective gene to almost the theoretical limit, which had probably been reached in the purebred Jersey herd from which the sires were purchased. The lethal was not comparable to those reported in rodents and other mammals.

Rental rate plan for bulls used in artificial insemination, J. W. Bartlett and E. J. Perry. (N. J. Expt. Stas.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 283–286*).—The rental plan for the use of semen of bulls in the New Jersey Breeding Association No. 1 is based on fixed charges of $3 for proved bulls, and for unproved bulls 50 ct. for 1- to 2-year-old bulls, 75 ct. for 2- to 3-, $1 for 3- to 4-, $1.25 for 4- to 5-year-old bulls, and $1.50 for bulls 5 yr. of age and over. There were added to these amounts for proved bulls 2 ct. for each percentage point that the first daughter's fat production is above the breed average for age and class, and 4, 6, 8, and 10 ct. that the first 2, 3, 4, and 5 or more daughters' fat production is above the breed average. For unproved bulls, 1 ct. is added for each percentage point above the breed average production of the daughters and ½ ct. per point for each percentage that the progeny of the grandparents exceed the breed average for age and class.

Effects of an unfractionated pituitary extract upon cystic ovaries and nymphomania in cows, L. E. Casida, W. H. McShan, and R. K. Meyer. (Wis. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 273–282*).—Intravenous injections of unfractionated sheep pituitary were administered to 96 cows with cystic ovaries, some of which showed nymphomania. The symptoms of nymphomania disappeared after one injection in 72 of 81 cows, but the symptoms recurred in 14, of which 6 showed uterine or tubal pathology. Manual palpation indicated that corpora lutea were formed in 74 of the 96 cows within 31 days after treatment. The single injection caused normal estrus in 69 of the cows. Pregnancies were found in 36 of the 53 normal animals bred, but no pregnancies occurred among 6 of the 12 animals bred showing abnormalities of the genital tract. Retreatment of 16 of the cows in which the cysts persisted after the first injection or recurred resulted in 6 pregnancies in animals with normal genital tracts. No pregnancies resulted from third injections to 3 animals.

A controlled experiment in feeding wheat germ oil as a supplement to the normal ration of bulls used for artificial insemination, G. W. Salisbury. (Cornell Univ.). (*Jour. Dairy Sci., 27 (1944), No. 7, pp. 551–562*).—In a group of 20 bulls fed a regular ration over nearly a year, supplementing the ration of one-half of the bulls with 1 oz. of wheat-germ oil daily did not increase the fertility or sperm viability as contrasted with the other half, which received no wheat-germ oil. Data were recorded on the semen characteristics of the bulls and their breeding behavior during the 3-mo. period before wheat-germ oil feeding and also while being fed the wheat-germ oil. The time that the bulls required for mating, from their approach to the "teaser" cow until the ejaculation, volume of ejaculate, number and motility of sperm, concentration of semen, and conceptions among the 3,681 artificial services of the wheat-germ-oil-fed bulls and the 4,565 services of the control bulls were recorded. The wheat-germ oil feeding did not prevent 2 bulls from decreasing in fertility to such low levels that they were withdrawn from use in artificial insemination. There was a highly significant decrease in the percentage of motile sperm during the early spring months and highly significant monthly differences in sperm counts, but no significant monthly differences in fertility were noted. Semen was collected from each bull approximately once each week.

The uterine wall of the cow, H. E. Kingman (*Amer. Jour. Vet. Res., 5 (1944), No. 16, pp. 223–227, illus. 2*).—The uterine wall of the cow is described, and the changes which occur in the ovary and uterus at different stages of the reproductive cycle as a result of the action of different hormones are diagramed.

A staining method for the differentiation of live and dead spermatozoa.—I, Applicability to the staining of ram spermatozoa, J. F. Lasley, G. T. Easley, and F. F. McKenzie. (Coop. U. S. D. A.). (*Missouri Sta. Cir. 292 (1944), pp. 8, illus. 1*).—A reprint of the article previously noted (E. S. R., 87, p. 500).

Hereditary and environmental factors affecting growth rate in swine, A. W. Nordskog, R. E. Comstock, and L. M. Winters. (Minn. Expt. Sta. and U. S. D. A.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 257–272, illus. 2*).—The factors of heredity and environment affecting the growth curve of swine were analyzed by variance and offspring dam regression technics. The data involved weights at specific ages from birth to 168 days and gains at intervals between these ages, as well as the average gains per day calculated both from birth and weaning to 200 lb. live weight. The average rate of gain per day totaled 1.53 lb. for the

2,396 pigs in the study. The inbreeding of the pigs was about 21 percent. The regression of rate of gain from weaning to 200 lb. on the inbreeding computed within years and lines was —0.0022 ± 0.0010, indicating the expected amounts of decline in growth rate with inbreeding without selection. The mean growth curve with the twentieth and fortieth percentiles above and below the mean were plotted. The pigs of sows were about 4 lb. heavier at weaning (56 days) than the pigs of gilts, a difference which was maintained at least to 168 days. Age differences of the dams accounted for 22 percent of the intraline and year variance in weaning weights, but there was little effect on later weights. Variance due to common environmental conditions within each litter was greatest at 21 days and accounted for 37 percent of the total variance. In gains it decreased from 24 percent 28 days after weaning to 7 percent 112 days after weaning. Analyses of variance of gains 28, 56, 84, and 112 days after weaning indicated that 18, 28, 39, and 45 percent, respectively, of the variability was hereditary. Variances in gains from birth to 200 lb. and weaning to 200 lb. were 21 and 40 percent hereditary, respectively. Differences between estimates of hereditability containing and not containing preweaning growth are overestimates. The hereditability of post-weaning gains is greater than post-weaning weights.

Seasonal incidence of anestrus in the postpartum rabbit, J. T. Bradbury. (U. S. D. A.). (*Anat. Rec., 88 (1944), No. 4, p. 424*).—Among 156 does having litters from June 1942 through May 1943, 50 percent of those having litters in October and November were anestric. The lowest number of anestric does was 6 percent in those with litters born in February and March. The average weights in the anestric and estric does were, respectively, pituitary 32 and 50 mg., ovary 0.37 and 1.02 gm., and uterus 5.4 and 14.9 gm. The differences in size and tonic condition of the uterus make it possible to judge quickly the sexual condition of the rabbit.

Evidence for early testis hormone secretion in the rat from a study of the epididymis, E. S. Cieslak (*Endocrinology, 35 (1944), No. 1, pp. 63–67*).—Castration of male rats at 1 day after birth caused a consistent decrease in the weight of the posterior portion of the epididymis as ascertained in normal and castrated rats autopsied at 8 to 45 days of age. Daily injections of 0.01 mg. of testosterone propionate caused increases in the weight of the epididymis of castrated rats. Hormone secretions by the testis can be detected by the eighth day of life. The studies were conducted with 96 castrated and control rats.

Effectiveness of blood and hemin for augmentation of pituitary gonadotropic extracts in the male, R. K. Meyer, W. H. McShan, and L. E. Casida. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 52 (1943), No. 2, pp. 78–80*).—The testes, seminal vesicles, and prostate glands were heavier from rats receiving extracts of unfractionated sheep pituitary with hemin than pituitary extract alone, showing augmentation of the hemin on the gonadotropic effect of the pituitary. The differences in the effects of doses of 100 and 200 mg. of the pituitary were not significant with 10 rats injected with each sized dose. The weights of the testes of immature chickens and pigeons were not further increased when hemin or blood was combined with the extract.

A study on inactivation of ovarian hormones by the liver, P. Engel (*Endocrinology, 35 (1944), No. 1, pp. 70–72*).—The atrophy of the uteri of rabbits whose ovaries had been transplanted into the mesentery was like that in spayed animals, but a normal uterus was maintained when the ovaries were transplanted into the large muscle of the back. Liver pulp placed in contact with estrogen inactivated it, but the liver pulp had no effect on progesterone. A total of six animals was employed in the investigation.

Effect of testosterone propionate on thermo-regulatory function of rat scrotum, J. O. ALMQUIST and F. N. ANDREWS. (Ind. Expt. Sta.). (*Anat. Rec., 89 (1944), No. 2, pp. 125–133*).—Evidence is presented that the thermoregulatory function of the rat scrotum is dependent on the testicular hormone. Scrotal contractility in the rat was decreased or prevented by castration, and was measured, and the weights of the scrotum and seminal vesicles were recorded in 100 rats following castration and injection with testosterone for 7, 14, and 21 days and compared with controls at 90 and 111 days. The results were analyzed by variance.

The histological changes in the pituitary caused by estrogen, I. T. ZECKWER (*Science, 100 (1944), No. 2589, p. 123*).—Attention is called to the similarity between the cytological changes in the pituitary due to pregnancy and those caused by estrogen administration. The explanation given is based on the high estrogen production of the placenta. "It seems reasonable to ascribe the histological changes to hypersecretion of the pituitary factor stimulating the mammary gland during the period when the breast is undergoing hyperplasia preliminary to lactation and to secretion of lactogen when the final period of pregnancy is reached."

Relative productivity under different systems of mink matings, C. F. BASSETT, F. WILKE, and O. P. PEARSON (*Amer. Fur Breeder, 16 (1944), No. 11, pp. 16–22, illus. 2*).—Results of the mating of 450 mink females indicated that the litters averaged 4.11 kits each from those mated on 2 consecutive days and subsequently remated, as contrasted with 4.08 kits from females mated on 2 consecutive days only. Among 187 mated once, there were produced 3.54 kits per litter. It is concluded that there is definite increase in size of litter produced by matings on 2 consecutive days. These results were separated by adult and yearling females, which showed the same conclusions.

A further note on size differentiation in Single Comb White Leghorns, I. M. LERNER and C. A. GUNNS. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 4, pp. 349–351*).—Further study of the size differences in two lines of White Leghorns (E. S. R., 90, p. 468) revealed that postembryonic growth differences were mainly responsible for the observed dissimilarity in shank lengths. Differences between them in the growing period were mainly ruled out, but there may have been differences in the original shank length. From 5 to 13 embryos were removed each day of incubation from both lines. The production-line embryos were, with one exception, heavier than the size-line embryos, and, with a similar exception, had longer shanks at each age. The higher growth rate of the production line may be due to difference in egg size and also in embryonic mortality. Initial size differences were not involved in the differentiation between the two lines.

Interbreed transplantation of definitive papillae as a means of analyzing feather pigmentation in fowl, H. WANG (*Jour. Expt. Zool., 96 (1944), No. 1, pp. 103–127, illus. 14*).—Transplantation experiments were conducted involving the whole or portions of the active and resting papillae between the breast and saddle tracts of the feathers of Brown Leghorns, White Leghorns, and Barred Plymouth Rocks of both sexes and Brown Leghorn capons. The transplantation experiments were conducted in three age groups—1, 3, and 8–12 mo. "The results of this work supplement the conclusions of Wang[1] that the functions of the epidermal and dermal components of the feather papilla are, respectively, the full realization of tract specificities and the control of normal development as well as the determination of the symmetry of the regenerating feather." An extensive bibliography is included.

The significance of inherited characters affecting egg production, F. A. HAYS. (Mass. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 310–313*).—Classification of 1,220 Rhode Island Red pullets hatched in the 5-yr. period 1938–42 showed an and castration cell formation. The conclusion was fairly well established that castrate pituitaries contain a larger quantity of gonadotropic hormone than pituitaries from controls.

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[1] Physiol. Zool., 16 (1943), No. 4, pp. 325–350, illus. 23.

Endocrinological aspects of avidin formation in the avian oviduct, R. Hertz, R. M. Fraps, and W. H. Sebrell. (U. S. D. A. et al.). (*Science, 100 (1944), No. 2585, pp. 36–37*).—The avidin titer of the oviducts of 42-day-old chicks was materially increased by the administration of stilbestrol and progesterone simultaneously. The avidin titer increased with increasing progesterone over at least a sixteenfold range whether stilbestrol was administered simultaneously or not. Similar reciprocal quantitative relations were observed for desoxycorticosterone as for progesterone. Thus there was no evidence of the decisive antogonism between estrogen and progesterone observed in the progestational response of the mammalian uterus. These results are thought to lend additional support to the possibility that avidin may play a role in the physiology of reproduction.

A comparison of the performance of four varieties of turkeys during the breeding season, D. Whitson, S. J. Marsden, and H. W. Titus. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 4, pp. 314–320*).—In groups of 19 to 21 turkey hens of each breed, with a tom, the average egg production to June 1 in 2 yr. for the standard-bred Bronze variety was 76, the White Holland 63, the Broad Breasted Bronze 59, and for the Beltsville Small White 62 eggs. The Broad Breasted Bronze and Beltsville Small White were significantly later in maturing each year than the standard-bred Bronze or the White Holland varieties. All birds lost weight between January 15 and June 1, males losing about 16 percent and females about 10 percent. The Broad Breasted Bronze had a significantly lower hatchability of fertile eggs set, averaging about 50 percent in the 2 yr., as compared with about 75 percent in the other three breeds.

External morphology of the turkey during the incubation period, R. E. Phillips and C. S. Williams. (Md. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 270–277, illus. 7*).—Daily changes in the structural development of Black and Beltsville Small White turkey embryos served as the basis for determining the age of the embryos. Eggs were stored at 52° F., incubated at 99.75°, and the embryos examined at 12-hr. intervals from 24 to 168 hr. and at 24-hr. intervals thereafter. Whole mounts were made of embryos up to 7 days. The Beltsville Small White turkey embryos developed slightly faster than those of the Black variety, and the embryonic development of the freshest eggs was slightly more advanced than in the Black birds. The somite counts increased from 7 pairs at 2 days to 47 pairs at 5½ days. Fusion of the mandibular arches occurred at 7 days. Formation of the upper jaw was complete at 9 days. Wings were fully formed at 10 days. Small feather papillae are on the back, tail, and thighs at 11 days. Closure of the eyes proceeds from the twelfth to the sixteenth days. Elongated plumage occurs on the back, thigh, and tail regions and later over all the body from the fourteenth to the seventeenth days. The poult fills the entire eggshell and the yolk sac is completely inside the body at 26 days.

Deposition of pigment in the sparrow's bill in response to direct applications as a specific and quantitative test for androgen, C. A. Pfeiffer, C. W. Hooker, and A. Kirschbaum (*Endocrinology, 34 (1944), No. 6, pp. 389–399, illus. 3*).—Study of the effect of various androgens applied intramuscularly or cutaneously to castrated male and normal female sparrows on the darkening of the bill showed that direct application of as little as 0.063 µg. of the testosterone daily in alcoholic solution to the bill of the castrated male English sparrow induced a unilateral deposition of a narrow band of pigment in the bill. When systematically administered, the pigment deposition was bilateral and diffuse and required 8 µg. daily for 10 days. Pigmentation occurred at the point of treatment with drops of the androgen in absolute alcohol. The minimum effective dose of testosterone so administered was 1 µg. distributed in equal daily amounts over 4, 8, or 16 days. The same response was elicited by androsterone. Pigmentation was not induced by direct application of progesterone and desoxycorticosterone in large amounts. The effect of testosterone was not modified by the daily administration of estradiol. Crude extracts of bulls' and boars' testes gave similar results on capons and pigmentation of sparrow bills. The results were identical with those evoked by testosterone and androsterone.

Overestimation of mean squares by the method of expected numbers, R. E. COMSTOCK. (Minn. Expt. Sta.). (*Jour. Amer. Statis. Assoc., 38 (1943), No. 223, pp. 335–340*).—"The actual subclass numbers in the data concerned [sex difference in growth rate of swine] did not deviate significantly, as judged by chi-square, from the expected numbers. However, the method of expected numbers by comparison with that of fitting constants overestimated the mean square for the sex-litter interaction by enough to have a bearing on interpretation of the results and the mean squares for litters by a slight amount. The differences in results of the two methods was interpreted to be the consequence of shifts in weighting squared deviations associated with the shift from observed to expected numbers. This led to expected results in reasonable agreement with those observed. The overestimation of mean squares reported should not be interpreted as a serious defect of the method of expected numbers. When the condition laid down by [G. W.] Snedecor for the fit of expected numbers to proportionality is met, the maximum overestimation of class and interaction mean squares is not large and the type of data for which a very close approach to this maximum occurs should not be overly frequent. Certainly the advantages cited by Snedecor when contrasted with the defect discussed command the method for wide usage. What has been presented should actually assist in judging in critical cases whether bias from the source considered is important, thereby permitting increased rather than decreased confidence in the usefulness of the method."

Analysis of variance for percentages based on unequal numbers, W. G. COCHRAN. (Iowa Expt. Sta.). (*Jour. Amer. Statis. Assoc., 38 (1943), No. 223, pp. 287–301, illus. 1*).—The following procedure is suggested: "Consider whether one of the simplest methods of analysis (equal weights, equal weights within treatments, equal weights within replicates) can be used without further investigation. If in doubt apply the appropriate test. If none of the methods in [the above] appears satisfactory, estimate the relative amounts of binomial and extraneous variation from an analysis of variance of the fractions or percentages." Examples are selected for the paper from the services and conceptions of six bulls in artificial insemination tests. The more closely the weighted numbers approach the true weights, the smaller is the disturbance of the z, F, and t values in levels of significance.

FIELD CROPS

The recovery of inter-block information in quasi-factorial designs with incomplete data, I, II, E. A. CORNISH (*Austral. Council Sci. and Indus. Res. Buls. 158 (1943), pp. 22, illus. 1; 175 (1944), pp. 19*).—This is a series of papers concerned with the recovery of information in these designs.

I. *Square, triple, and cubic lattices.*—An approximate method for dealing with square, triple, and cubic lattices is described, and the effect of the approximations on estimation of adjusted treatment effects and their errors and analysis of variance are discussed.

II. *Lattice squares.*—A discussion of the extension of the method described above to lattice squares.

The analysis of cubic lattice designs in varietal trials, I. F. PHIPPS, A. T. PUGSLEY, S. R. HOCKLEY, and E. A. CORNISH (*Austral. Council Sci. and Indus. Res. Bul. 176 (1944), pp. 41, illus. 1*).—Procedure to be adopted for recovering interblock information in cubic lattice designs is described in detail, and computations required for the full analysis are illustrated by a numerical example.

Agronomic advances in the agriculture of the Corn Belt and the Great Plains regions, H. K. WILSON. (Minn. Expt. Sta.). (*Science, 99 (1944), No. 2582, pp. 499–505*).—Contributions in recent years by State stations cooperating with the U. S. Department of Agriculture in research with wheat, corn, oats, barley, flax, sorghums, soybeans, alfalfa, sweetclover, grasses, pasture, sugar beets, emergency crops, and weed control are reviewed.

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 8, pp. 1, 2, 7*).—Findings in recent experiments are reported in articles entitled Small Grains Plus Legumes for Pasturage (pp. 1, 8) and Time of Cutting, Handling Methods for Quality Hay (p. 2), both by H. W. Bennett; Soil Fertility Practices for Cotton in Delta, by J. Pitner (p. 2); and Victorgrain, New Nortex, Delta Red 88, Stanton, Letoria, Quincy [Oats] Show Well in Test, by J. F. O'Kelly, (p. 7).

Small grain and corn variety tests, F. S. PRINCE, L. J. HIGGINS, and P. T. BLOOD (*New Hampshire Sta. Cir. 67 (1944), pp. 11*).—Early maturing dent or dent-flint hybrid corn varieties have been found satisfactory for use in New Hampshire, those tested 1941–43 averaging almost 10 bu. more per acre than native flints. Minhybrids 700, 800, and 402 and Jacques 802 are adapted to the southern half of the State. New Hampshire 500, an old selection from Minnesota 13, is also a high yielding dent corn. Maine A and B and Wisconsin 240 of the dent-flint hybrids have proved satisfactory. Many other dent or dent-flint hybrids that evidently will mature in the climate were not included in the trials. For northern New Hampshire adapted flints should still be largely grown, although farmers interested in grain production might try earlier maturing hybrids.

Erban and Vanguard, two Canadian varieties, and Upright have been the highest yielding oats in the Colebrook area. Vanguard and Ajax (another Canadian oats), both resistant to stem rust, and Vicland, resistant to both stem and crown or leaf rusts and smut, are recommended for southern New Hampshire, and Tama, also disease-resistant, may prove satisfactory.

Important species of the major forage types in Colorado and Wyoming, D. F. COSTELLO. (U. S. D. A. coop. Colo. State Col.). (*Ecol. Monog., 14 (1944)*, No. *1, pp. 107–134, illus. 20*).—During numerous recent forage inventories and range surveys in Colorado and Wyoming, more than 2,000 species were encountered, and of these 85 grasses and grasslike plants, 130 weeds, and 60 browse plants were selected as important from the viewpoint of range management. Information is compiled on the most important plants, their frequency of occurrence and relative forage production, and their values in developing range management plans for each major forage type in the groups: Great Plains 5 types, mountain region 10, and semidesert area 3 types.

Key to some Colorado grasses in vegetative condition, H. D. HARRINGTON and L. W. DURRELL (*Colorado Sta. Tech. Bul. 33 (1944), pp. 86, illus. 119*).—The 119 species described and illustrated include practically all of the common grasses and those of economic importance. An index to botanical and common names is appended. The key is designed for use in conjunction with Hitchcock's Manual of Grasses of the United States (E. S. R., 73, p. 465).

Sedges and rushes of Colorado (grass-like plants), E. C. SMITH and L. W. DURRELL (*Colorado Sta. Tech. Bul. 32 (1944), pp. 63, illus. 14*).—Sedges and rushes form an appreciable part of the forage resources of Colorado, but unequal forage value of different species make their identification important. Species existing in Colorado are described and illustrated and are classified in determinative keys with comments on distribution and palatability. A glossary and an index are included.

Root reserves of South African highveld grasses in relation to fertilizing and frequency of clipping, H. WEINMANN (*Jour. So. African Bot., 10 (1944), No. 2, pp. 37–54, illus. 3*).—Five important high-veld grasses growing under natural conditions, *Trachypogon plumosus, Tristachya hispida, Eragrostis chalcantha,* and *Brachiaria serrata,* all typically tufted, and *Digitaria tricholaenoides,* which forms irregular mats by means of rhizomes, were cut 1, 2, 4, 9, and 16 times per season for 2 yr. Increased frequency of clipping reduced weights of roots and rhizomes and lowered the percentages of reducing sugars, nonreducing sugars, and starch in these organs, while the percentage of acid-hydrolyzable polysaccharides remained unaffected. Fertilizers increased root weights of some species under moderate defoliation but had little effect on carbohydrate content. Cutting at fortnightly intervals (16 times per season) for 2 yr. led to almost complete exhaustion of root reserves and to death of many plants. Fertilizer (NPK) tended to aggravate rather than to counteract these effects of excessive defoliation. Weights and carbohydrate content of rhizomes of *D. tricholaenoides* were less affected by frequent clipping than those of the roots of this and other species. Depletion in root reserves due to frequent clipping was associated with corresponding reductions in herbage yields.

The growth and carbohydrate responses of Agropyron smithii and Bouteloua gracilis to changes in nitrogen supply, H. M. BENEDICT and G. H. BROWN. (U. S. D. A.). (*Plant Physiol., 19 (1944), No. 3, pp. 481–494*).—Lack of N reduced the total weight of plants of bluestem and blue grama (common range grasses in the central Great Plains) grown from seed and clones, 1936, 1938–40, in complete and —N solutions, but favored root growth while abundant N favored top growth more. The main effect of lack of N was to increase the percentage of sucrose and starch in bluestem (its carbohydrate reserves), and of sucrose in blue grama. Making N available to plants without it for a time tended to reduce the percentage of carbohydrates built up when N was lacking.

Six alfalfa varieties tested for 7 years at high altitudes; "Ladak" is best yielder, D. KOONCE (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 4, pp. 10–11*).—Acre yields of alfalfa varieties grown at Fort Lewis Substation, 1937–43, under disease-free conditions, averaged for Ladak 4.85 tons air-dry forage, Grimm (local) 4.63, Meeker Baltic 4.58, Grimm 4.53, Colorado common 4.51, and Hardistan 4.36 tons. About 59–60 percent of the total average yield was obtained at first cutting, July 3, and 40–41 percent at second cutting September 13.

Influence of fertilizers on the accumulation of roots from closely clipped bent grasses and on the quality of the turf, R. S. BELL and J. A. DEFRANCE. (R. I. Expt. Sta.). (*Soil Sci., 58 (1944), No. 1, pp. 17–24*).—Continued experiments (E. S. R., 81, p. 504) showed that increasing the quantities of N or K applied to bentgrass putting greens may increase the weight of accumulating roots, whereas large amounts of P may reduce root accumulations. The state of equilibrium between growth and decay of grass roots does not affect materially the quality of the turf if adequate N, balanced with a moderate quantity of P and a small amount of K, is applied at suitable intervals. Piper velvet bent accumulated more roots than Rhode Island bent or Washington creeping bent, which were similar in root production. Velvet bent becomes "root bound", and increasing amounts of N failed to change significantly the weight of accumulated roots.

Home-grown clover seed may relieve shortage on many Pennsylvania farms, E. J. ANDERSON, F. V. GRAU, H. W. HIGBEE, and J. K. THORNTON *(Pennsylvania Sta. Bul. 446, Sup. 3 (1944), pp. [1] + 1, 10, illus. 4)*.—Economical yields of seed of alfalfa and clover appeared possible if honeybees are provided to work the blossoms. Under such conditions from 2.5 to 5 bu. per acre of clover seed and 3 to 6 bu. of seed of variegated alfalfa have been produced near the station. Differences in seed setting were noted among clover strains and in caged v. open-field clover. A hammer mill used to grind feed on farms, supplemented by a farming mill, hulled and cleaned the seed. Seeds of timothy and orchard grasses were harvested with reduced losses from shattering by modifications of cereal harvest methods, involving use of a binder and subsequent threshing with a combine.

Híbridos comerciais de milho [Commercial corn hybrids], C. A. KRUG, G. P. VIÉGAS, and L. PAOLIÉRI *(Bragantia, 3 (1943), No. 11, pp. 367–552, illus. 65; Eng. abs., p. 551)*.—Report is made on a corn improvement project, 1932–42, including descriptions of basic material, details of methods used, annual results, and adaptation of exotic lines, mainly from the United States. Up to 1941–42, 133 (3.5 per cent) of more than 3,700 hybrid combinations significantly outyielded control varieties by from 7 to 92 per cent in three different ecological zones in the State of São Paulo, Brazil. Production of hybrid seed corn on a commercial scale was planned.

Successful corn hybrids must suit the environment where grown, L. L. HUBER *(Pennsylvania Sta. Bul. 446, Sub. 3 (1944), pp. 4–5, 7, illus. 3)*.—The need for corn hybrids that are suitable for particular environments is illustrated by comparative yields, maturity, moisture contents, lodging, and other agronomic characters tabulated from performance tests for a number of open-formula hybrids and open-pollinated varieties.

Niacin in maize, P. R. BURKHOLDER, I. MCVEIGH, and D. MOYER *(Yale Jour. Biol. and Med., 16 (1944), No. 6, pp. 659–663)*.—Assays of mature corn of 233 strains and hybrids showed niacin (values expressed as micrograms per gram of air-dried mature grain) to average for yellow corn 21.4 (range 11.3–36.3), white 20.1 (12.7–29.4), sweet corn 34.6 (18.2–62.1), and popcorn 17.4 (7.9–21.6). Preliminary data obtained for inbred lines and hybrids between them suggest that genetic factors control ability of the corn plant to store niacin. Available data indicate that hybrids between high and low niacin lines may have an intermediate content, and those hybrids with the largest amounts of niacin come from parental lines high in niacin. The fact that different strains of both sweet corn and field corn, grown adjacent in the same soil at the Connecticut [New Haven] Experiment Station, contain widely different amounts of niacin points to the importance of inheritance in determining vitamin content.

"In view of the obvious variation of vitamin content in different genetic strains of maize produced in different geographical regions, it is suggested that corn breeders, and those who process and distribute corn products, may do well to consider the selection of better types of maize for use by people whose dietary is conducive to pellagra and other deficiency diseases."

Seed characters and lint production: Relation of naked seed to lint percentage, lint index, staple length, and seed index in sea island cotton, J. O. WARE, W. H. JENKINS, and D. C. HARRELL. (U. S. D. A. coop. S. C. Expt. Sta.). *(Jour. Hered., 35 (1944), No. 5, pp. 153–160, illus. 2)*.—In seed cotton of the Westberry, Bleak Hall, and Andrews varieties of sea-island cotton, location and size of seed fuzz tufts— whether on one or both ends of the seed or large or small—did not materially affect the level of lint percentage, lint index, staple length, or seed index. The magnitude of each of these characteristics depended on variety. Fuzzless or naked seed individuals of the Seabrook variety produced lint percentage and lint index values definitely lower than those of its normal seed fuzz forms; staple length and seed index were not affected much by condition of seed fuzz. Gaddis cotton had a much larger proportion of naked seeds and shorter staple, lower lint percentage, lint index, and seed index than Seabrook, but no significant differences were apparent in the levels of these four characteristics to the different fuzz grades. Results of Gaddis progeny rows in 1943 verified this relationship. Naked seed in sea island appeared to be a recessive character.

Improved rooting of Cryptostegia cuttings callused on the plant, H. F. Loomis and J. H. Heuer. (U. S. D. A.). (*Torreya, 44 (1944), No. 1, pp. 8–11, illus. 2*).—Girdling to cause large calluses, with great food storage capacity, appeared to increase rooting expectancy of cuttings and speed of rooting and size of roots. These conditions were improved further by use of a plant-growth substance on the callus when the cutting was made. Summer rooting of "old girdled" cuttings may be as good as rooting in cooler weather when a temperature differential may be maintained with bottom heat.

Flax facts, E. J. Mitchell, A. C. Dillman, et al. (*Minneapolis: Japs-Olson Press, 1944, 2. ed., rev., pp.* [205], *illus. 16*).—A compilation of information on production of flaxseed, recommended varieties, flax weeds, and diseases, uses of linseed oil, oil meal, and flax straw, and commercial movement of the crop, assembled in loose-leaf form as contributions from experiment station, State, Federal, and industrial specialists on the crop. See also an earlier note (E. S. R., 63, p. 440).

The propagation of guayule from cuttings, M. S. Nishimura, R. Emerson, T. Hata, and A. Kageyama. (*Amer. Jour. Bot., 31 (1944), No. 7, pp. 412–418, illus. 6*).—Guayule could be propagated freely from cuttings at any time of year. Best results have been obtained in early spring, after growth has started, but before the long internodes of later-season growth have developed. Cuttings from later-season growth also root easily if cut short enough, but are more prone to damping off. Use of root-inducing hormones did not in general improve the rooting of guayule cuttings appreciably, but was effective on late-season cuttings cut too long to root easily without treatment. Rooted cuttings could be transplanted easily to the field, started growth more rapidly than transplanted seedlings, bloomed earlier, and produced as much rubber during the first year as plants of comparable age from seed.

Hemp production experiments: Cultural practices and soil requirements, C. P. Wilsie, C. A. Black, and A. R. Aandahl. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P63 (1944), pp. 46, illus. 20*).—Experiments with hemp, 1942–43, were concerned with seeding practices, fertilizers, soil types, yields after other crops (E. S. R., 91, p. 151), and other production practices. Results in several localities led to the recommendation of planting 5 pk. of seed per acre in preference to 3 pk. because of the greater likelihood that stalks more nearly ideal in size, yielding a higher percentage of fiber and a greater total yield of fiber, will be produced. Drilling seed was found preferable to broadcasting, producing better stands and higher yields. Planting in late April or early May, before corn planting, appeared desirable. Indications were that if hemp is mature enough to be harvested during August 25–31 and September 1–10, field retting may be expected to be more successful than when harvesting is delayed until September 15 or later.

In fertilizer trials on six soil types in the hemp-growing area, where N (25 lb. per acre), P (50 lb. P_2O_5), and K (25 lb. K_2O) were applied singly and in combinations, average increases in acre yield of dry, retted straw from fertilization ranged for N from 0.37 to 0.90 ton, P from 0.12 to 0.80 ton, and K from —0.32 to +0.25 ton. N 100 lb. per acre produced substanital yield increases over N 25 lb., which was not enough for maximum yields. Response to P was limited by N deficiency in a number of cases. N-P combinations produced higher yields than did either N or P or PK. K in general did not increase hemp yields. Hemp yields were usually highest on soil types which contained the greatest quantities of N and organic matter, provided drainage was adequate.

Peanut production possibilities in South Carolina, J. C. DOWNING, G. H. AULL, K. V. GOODMAN, and M. J. PETERSON. (Coop. U. S. D. A.). (*South Carolina Sta. Bul. 351 (1944), pp. 49, illus. 14*).—Part 1, on production possibilities in the State, deals with production in 1942 and 1943 and prospects for 1944, and the location and extent of soils suitable for the crop and expansion possibilities. Part 2, on production possibilities in Bamberg County, is designed to show in more detail how problems and needs in the State apply in a county. Discussion is accorded suitability of the soils and yield relationship among soil groups suitable for peanuts, oil production from peanuts and cotton, returns from peanuts and competing crops of cotton, corn, and peanuts hogged off, appropriate production practices to increase yields and profits, and increasing the acreage of peanuts on the small, medium-size, and large individual farms. Methods of identifying soils suitable for peanuts and used in determining their extent and distribution are appended, together with lists of these soils as grouped, and an outline map showing generalized soil associations.

Roguing field peas, D. G. WELLS and I. M. INGHAM. (Coop. U. S. D. A.). (*Wash. State Col. Ext. Cir. 76 (1944), pp. 4*).—Practical instructions on removal of off-type plants in a field pea variety cover origin and indentification of rogues, organization of a roguing crew, and time of roguing.

Potato breeding, whither bound? F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 7, pp. 192–199*).—Accomplishments of the national potato-breeding program active during 14 yr. are reviewed and plans for future work are outlined.

Influence of nitrogen, phosphorus, potassium, and calcium on tuber and foliage weight of potatoes, R. L. CAROLUS. (Va. Truck Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 7, pp. 199–203*).—After dry seasons in which much of the N applied was not used by the crop but was prevented from leaching by green manures, a reduction in N applied for potatoes appeared desirable. On acid soils large quantities of P in fertilizers apparently are necessary, regardless of previous weather, until the phosphate-fixing capacity of the soil is satisfied. Tuber yields were not necessarily correlated with plant growth, for both low and high yields were produced on plats with both low and high plant weights. A 5–10–5 fertilizer seemed as well suited to most soils on the Eastern Shore of Virginia as the 6–8–6 analysis, and high analysis phosphatic materials might properly be used in its formulation.

Studies on potato nutrition.—I, The effects of fertilizer treatment on the yield and composition of Kern County potatoes, O. A. LORENZ. (Univ. Calif.). (*Amer. Potato Jour., 21 (1944), No. 7, pp. 179–192*).—In yield and nutrient-analyses studies with White Rose potatoes grown in fertilizer experiments at Saco, Calif., and the U. S. Cotton Experiment Station at Shafter in 1942, N was the predominating nutrient element affecting yield, P may have given a slight response, and K had no effect. N 52 lb. per acre increased yield from 233 to 382 sacks per acre at Shafter, and N 60 lb. increased the yield from 174-251 sacks at Saco, and even higher N rates might be beneficial. Soluble nutrients in petiole tissues indicated that if plants contain less than 800 p. p. m. of nitrate 1 mo. after emergence, the yield will be depressed, agreeing with data of Carolus (E. S. R., 80, p. 477).

Nitrates decreased rapidly as the plants matured. During the most rapid growth period soluble P was less than 70 p. p. m. in plants on no-P plats. Soluble potash (K_2O) never ranged less than 10,000 p. p. m., about three times the minimum of 2,200 at the beginning and 4,500 p. p. m. at the end of the season. Starch content decreased from 17.0 percent for tubers produced without N to less than 13 percent for tubers grown on plats receiving N 210 lb per acre. N was lower in all parts of plants grown on no-N plats than in plants on N plats. P was lower both in plants on no-N and no-P plats. Omission of fertilizer N greatly reduced P absorption by all plant parts analyzed. K was high in all samples, not being affected by fertilizer treatments. Ca was highest in plants grown without N and lowest in those grown without P. Mature tubers from liberally fertilized plats contained (expressed as percentage of fresh weight) dry matter 21.0, N 0.037, P 0.067, K 0.489, Ca 0.008, Mg 0.029, and ash 0.939 percent.

Studies on potato nutrition.—II, Nutrition uptake at various stages of growth by Kern County potatoes, O. A. LORENZ. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 389–394*).—Determination of seasonal nutrient uptake of potatoes grown at three nutrient levels revealed that total absorption of ash varied from 480 to 892 lb. per acre, N 65 to 189 lb., P 14 to 31, K 169 to 272, Ca 35 to 55, and Mg from 13 to 33 lb. Tubers alone accounted for removal of from 245 to 377 lb. of ash per acre, N 50 to 149, P 13 to 27, K 113 to 197, Mg 7 to 12, and about 3 lb. of Ca. Nearly all of the tuber growth occurred between 60 to 100 days after planting or from 30 to 60 days after plant emergence.

Suitability for dehydration in white potatoes as determined by the factors of variety and place of production, I, J. S. CALDWELL, C. W. CULPEPPER, and P. M. LOMBARD. (U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 8, pp. 211–216*).—Each of the 19 varieties of late or main-crop potatoes from nine stations in seven Northern States was found in tests capable of producing a dehydrated product of high quality when grown under suitable conditions. If the variety was grown under each series of conditions to which it was progressively less adapted, quality of the dried product became progressively poorer. A consistent correlation was noted between specific gravity of the fresh entire tubers and quality of the dried product. Raw stock of high specific gravity gave larger yields of dry product with a more desirable texture or consistency (dryness or mealiness) when refreshed and cooked than stock of lower specific gravity. Since color and flavor varied independently of specific gravity, high specific gravity did not always determine high quality of product, but very few lots of potatoes of low specific gravity yielded products of the highest quality. These results are in general accordance with the work of Clark, Lombard, and Whiteman (E. S. R., 83, p. 768), who found a high positive correlation between specific gravity and the dryness and mealiness considered desirable in potatoes.

Suitability for dehydration in white potatoes as determined by the factors of variety, place of production, and stage of maturity, II, J. S. CALDWELL, C. W. CULPEPPER, and F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 8, pp. 217–229*).—The merits for dehydration of early or spring potatoes from important southern districts and from California were studied with nine varieties. As a whole, dehydrated products made from early-crop potatoes ranked significantly lower in quality than those made by identical methods from late-crop potatoes of the same varieties. This result appeared due to some extent to the custom in the South of harvesting when plants are still green and vigorous and tubers immature, and in part to imperfect adaptation of existing varieties to climatic conditions under which the early crop is grown. Low yields and absence of highest quality in dehydrated products made from immature potatoes indicate that tubers intended for dehydration should be allowed to mature before digging.

The characteristics of certain varieties of potato with special reference to their suitability for drying, W. G. Burton (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 89–96*).—Yields per acre, cooking quality, dry matter content, and merits for drying are described for a number of potato varieties of different maturity groups and grown extensively in Great Britain. For drying, partly cooked strips, Catriona, King Edward VII, or Up-to-Date may be most suitable. In Scotland and Northern Ireland, heavy-yielding and high-quality late main-crop varieties are most popular, and would seem eminently suitable for any process involving drying cooked mashed potato or potato suspensions. If rather large pieces are to be dried and the reconstituted product is to contain separate firm pieces, such early sorts as Arran Pilot, Eclipse, Ninetyfold, and Epicure seem desirable.

Proceedings of the seventeenth annual meeting [of the] Asociación de Técnicos Azucareros de Cuba (*Habana: Asoc. Téc. Azucareros Cuba, 1943, pp. 135, illus. 64*).—Technical articles include Method and Formula for Estimating Cyclone Damage to Sugar Cane, by F. Poey (pp. 9–11); Effects of Drought on the Cane Yield, by C. E. Beauchamp (pp. 13–28); The Situation as Regards Cane Varieties in Cuba in 1943, by F. Agete (pp. 29–31); Cane and Sugar Estimates From a Technical Point of View, by R. Pedrosa and S. Gonzalez (pp. 33–40); A New Boiling House Efficiency Formula, by E. M. Copp (pp. 41–43); Sucrose Losses by Inversion, by F. A. López Ferrer (pp. 45–47); Dehydration of Molasses at Central Hormiguero, by J. C. González Maíz (pp. 49–57); Toward the Manufacture of Integral Sugar, by M. A. Mascaró (pp. 59–64); Whole Sugar as a Food, by J. J. Lima (pp. 65–67); The Simultaneous Manufacture of Raw Sugar and Alcohol, by A. Cairó Amador (pp. 69–72); Influence of the Settings on the Work of the Mills, by J. C. González Maíz (pp. 73–90); Cane Knives Increase Milling Efficiency, by P. V. Tippet (pp. 91–94); A Study of Cane Fiber From Different Varieties and Seasons, Its Composition and Behavior, by R. Pedrosa Puertas (pp. 95–110); Heating in Electric Motors, by O. A. Rodrígues (pp. 111–115); Common Causes of Tube Failures, by H. G. Gregory (pp. 117–125); and Solution to the Problem of Cleaning the Outside Surface to Boiler Tubes, by J. Palazuelos Maruri (pp. 127–132).

Sampling juice from experimental lots of sugar cane, G. Arceneaux and L. G. Davidson. (U. S. D. A.). (*Sugar [New York], 39 (1944), No. 8, pp. 32–35, 37, illus. 1*).—The component of the over-all error of sugar yield determination, attributable to variation of samples from the same lot of sugarcane juice, was found small in comparison with errors due to variability of replicated samples of cane. However, differences within individual lots of juice, due presumably to incomplete mixture of juice from different stalks or from top and butt portions of the stalks, were found important enough to merit attention. In tests at the Houma, La., Field Station the fractionating device described proved highly effective in reducing differences in analyses between replicated samples of juice.

Sunflowers as a crop, K. J. Kucinski and W. S. Eisenmenger (*Massachusetts Sta. Bul. 415 (1944), pp. 8, illus. 5*).—Cultural methods, based extensively on tests during 5 and 6 yr., are outlined and comments made on diseases and pests and uses of sunflowers. The crop may be grown in Massachusetts on any soil, preferably a light loam, which will produce corn and has similar cultivation requirements. Practices found productive include use of 400–500 lb. per acre of corn fertilizer as 5–10–5, 5–8–7, or 3–12–6 in hills, or twice as much broadcast; planting 5–7 lb. of seed per acre—one seed 1 in. deep, 18 in. apart in 3 ft. rows—about corn planting time, a good variety as Mammoth Russian, cutting off the heads September 16–30, and drying on boards or dry ground about 2 weeks. Seed yields should average 1 ton per acre in Massachusetts, although as much as 2 tons per acre has been obtained in station tests. Up to 19 tons of silage were made per acre, comparable with corn. Sunflowers have had no effects on the soil detrimental to following crops even with tobacco, very sensitive to preceding crop, in experiments in the Connecticut Valley. Sunflower stalks chopped fine with a silage cutter made very good litter for poultry.

Emerald, new type of sweetclover, K. F. Manke and W. H. Friend. (Tex. Expt. Sta.). (*Seed World, 56 (1944), No. 3, p. 8*).—Emerald, a new white-blossomed annual sweetclover developed at the Weslaco (Tex.) Substation, has distinctive green seed, has finer stems and more branches, and is leafier than Hubam. Emerald showed much greater recovery than Hubam after close grazing near Bishop and was pastured long after *Melilotus indica* had matured. This sweetclover has yielded less total forage than Hubam, yet it is a hay and grazing plant of better quality and should replace Hubam wherever annual sweetclovers are used for forage, particularly in irrigated sections. The new sweetclover was derived by selection among the progeny of a cross made at Lincoln, Neb., between Hubam and a many-stemmed, crown-branching, leafy, green-seeded, white-blossomed, biennial sweetclover selected at Brookings, S. Dak., in 1935.

Soil treatments for winter wheat: A summary of field experiments, L. B. Miller and F. C. Bauer (*Illinois Sta. Bul. 503 (1944), pp. 175–211, illus. 14*).—Experiments involving winter wheat on soil fields (E. S. R., 78, p. 479) distributed over Illinois and in cooperation with farmers, concerned with treatment systems to improve productivity, direct fertilizer application at planting and their combinations are reviewed and summarized.

Suggestions to growers based on the findings include choice of adapted varieties (E. S. R., 91, p. 411). Rotations should provide a moderate supply of nitrates and organic matter in the soil at seeding time. On soils moderate or low in productivity, wheat may be grown after legume or sod crops, but on fertile soils it had better follow a small grain. Liming of acid soil is needed for a good growth of soil-building legumes, considered a good source of N. For P-deficient soils (E. S. R., 87, p. 640), application of 1,000 to 1,500 lb. of rock phosphate per acre every 8 to 12 yr. is recommended. Superphosphate or other P carriers have given best results when applied in small quantities for each responsive crop in the rotation. Drilling P or PK fertilizers is effective on soils low in these nutrients. Standard grades, as 20-percent superphosphate and 0–20–10, may be drilled at rates of 100 to 150 lb. per acre at seeding time. If broadcast, the fertilizer should amount to 200 to 250 lb. and applied before seeding and mixed with the surface soil. K, where needed, may be supplied by 100 to 250 lb. of potassium chloride broadcast at seeding time, the optimum rate depending on degree of deficiency and the way other crops in the rotation are fertilized. With wheat sown after a late-maturing crop, as soybeans, temporary P deficiency may develop and justify drilling superphosphate or mixed fertilizers even on soils otherwise well supplied with available P. Early spring applications of 100 to 125 lb. of ammonium sulfate per acre, or its N equivalent in other carriers, have given good returns on N-deficient soils. Top dressing with nitrate fertilizers on fertile land is usually ineffective and may cause lodging. Where lodging is a serious problem, as on soils high in nitrates, stiff-strawed wheat varieties should be grown. Under Illinois conditions hazards from winterkilling and drought and from insect and disease injury have been materially reduced and yield and quality increased by good soil management.

The effect of level of soil fertility on wheat quality, W. W. Worzella. (Ind. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 2, pp. 107–119*).—Determinations of test weight, kernel size, gluten strength, granulation, carotenoid pigment, crude protein, and ash data for the five varieties of wheat grown on three levels of soil fertility at each of three locations 1937–41 (E. S. R., 89, p. 212) showed that in general wheat quality improves as soil fertility increases. Wheat produced on well-fertilized plats was stronger in gluten, lower in carotenoid pigments, and higher in flour yield than that on plats low in fertility. Variety caused greatest variations and had most influence in producing differences in components of quality studied.

[Evaluating quality of wheat varieties] (*Cereal Chem., 21 (1944), No. 1, pp. 38–64, illus. 8*).—Papers in this group concerned with evaluating the quality of wheats by means of the mixograph include Varietal, Station, and Seasonal Effects Upon Some Properties of Mixograms Made From Hard Red Spring Wheat Flours by Various Mixing Methods, by R. H. Harris, L. D. Sibbitt, and M. Elledge (pp. 38–48) (N. Dak. Expt. Sta.); The Use of the Mixogram in Evaluating Quality in Soft Wheat Varieties, by V. H. Morris, C. E. Bode, and H. K. Heizer (pp. 49–57) (U. S. D. A. and Ohio Sta.); and Sifted Wheat Meal Mixograms for Selecting Soft Wheat Varieties, by C. A. Lamb (pp. 57–64) (Ohio Sta.).

How wheats behave in competition with one another, L. R. WALDRON (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, pp. 7–14*).—Group B of five varieties of wheat did best when grown competing in alternate rows with the lower yielding group A of five varieties, especially in April 17 and May 3 seedings. Group A wheats, however, did best when not competing with group B wheats with the above seeding dates. The different types of competitive effects were measured in terms of yield, in number of heads per meter of row, and in milling and baking behavior. As a practical conclusion, it is suggested that a wheat which can stand up under strong competition with other varieties is probably able to maintain its yielding capacity in competition with weeds, or other unfavorable conditions, better than a less vigorous wheat. Wheats apparently must be tested for behavior under competitive conditions.

The Pusa wheats: The wheat-breeding work of the Imperial Agricultural Research Institute, B. P. PAL (*Empire Jour. Expt. Agr., 12 (1944), No. 46, pp. 61–73*).

The effect of rains on mature wheat, C. O. SWANSON (*Northwest. Miller, 219 (1944), No. 2, Sect. 2, pp. 6a–9a*).—Experiments at the Kansas Experiment Station in which wheat was exposed to light rains and to artificial wetting showed that important changes in physical properties take place when wheat is wetted by rain after it is once dried. The test weight is lowered, exteriors of the kernels become a dull yellow in color, and the endosperm is changed from a vitreous to a mealy condition. Varietal differences in resistance to change due to exposure were evident. These changes, however, do not bring about any decrease in flour yield or impair flour quality. Loaf volumes and loaf textures were as good from the samples subjected to rains as were those of loaves made from flours of wheats not subjected to rain.

Factors that influence the physical and other properties of wheat.—V, Effect of frequent rains accompanied by storms on Blackhull, Chiefkan, and Tenmarq, C. O. SWANSON. (Kans. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 2, pp. 126–140, illus. 1*).—Frequent rains accompanied by storms during heading and ripening of wheat had the same general effects of the smaller rains mentioned above. Greater mechanical losses in the field caused by the larger rains were not reflected in wheat quality.

Factors that determine wheat protein, M. A. MCCALL. (U. S. D. A.). (*Northwest. Miller, 219 (1944), No. 11, Sect. 2, pp. 3a, 7a–10a*).—Reasons for variation in protein content of wheat are discussed with particular consideration to climatic and regional differences, type and variety of wheat, soil fertility level, soil N and Ca, location of nitrates in the soil, effects of rainfall and irrigation on nitrification, carbohydrate synthesis, and plant diseases.

A preharvest survey of the protein content of western Canadian wheat of the 1943 crop, J. A. ANDERSON, K. W. NEATBY, and I. LEVI (*Cereal Chem., 21 (1944), No. 4, pp. 283–295, illus. 6*).—The protein content of the 1943 crop of western Canadian wheat, studied with 1,504 samples collected by country elevator agents just before harvest, was compared with results by a postharvest survey made with 5,645 samples taken from grain delivered by farmers to country elevators. The preharvest protein map of Manitoba, Saskatchewan, and Alberta resembled the postharvest map much more closely than it resembled corresponding postharvest maps for any of the preceding 16 yr. A correlation coefficient of 0.93 was obtained between the pre- and postharvest data for the mean protein levels of crop districts. Preharvest data gave 13.55 percent for the protein content of the whole crop, and the postharvest data 13.43 percent.

The effect of variations in Canadian spring wheat on the thiamine and ash of long extraction flours, A. HOFFER, A. W. ALCOCK, and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 3, pp. 210–222, illus. 4*).—Thiamine values for 383 samples of hard red spring wheat grown in western Canada in 1941 ranged from 2.9 to 6.3 µg. per gram (1.32 to 2.86 mg. per pound with a mean of 4.56 µg. per gram (2.07 mg. per pound). Samples from Alberta were significantly lower and more variable in thiamine content than Saskatchewan or Manitoba samples. A significant positive correlation existed between protein and thiamine. Negative correlation between mean yield per acre and average thiamine content of western Canadian wheat crops was evident in data for three seasons. Relationship of thiamine content to ash content varied widely in wheats grown in different localities. Such variations are reflected in thiamine-ash ratios of long extraction flours, with the result that some commercial mills have more difficulty than others in producing such flours within specified ash and thiamine limits. See also an earlier note (E. S. R., 89, p. 65).

Effect of environment during the growth and development of wheat on the baking properties of its flour, R. M. SANDSTEDT and K. FORTMANN. (Nebr. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 3, pp. 172–188, illus. 4*).—The Turkey, Nebred, Tenmarq, Cheyenne, Blackhull, and Chiefkan varieties of hard winter wheat were markedly affected in baking properties by the environments in which grown. All varieties from one locality showed high absorption, from a second locality poor handling properties, from others shorter or longer than normal mixing requirements, and from still others exceptional loaf volume potentialities. These variations from expected behavior were largely independent of protein content. Quality in some wheats seemed practically independent of protein content, while in others it declined as protein content increased. Varieties tended to respond similarly to environmental changes, yet degree of response was determined by individual variety. Those with low loaf volume potentiality gave least loaf volume response to changes in environment, while wheats with high loaf volume potentiality gave the greatest responses. The same held true for mixing requirement. Correspondingly, varietal differences in loaf volume were greatest in localities producing flours with largest loaf volume potentialities, and differences in mixing requirement between varieties were greatest in localities producing longest mixing requirements. Blending efficiency of flour protein, while largely dependent on variety, may be affected materially by environment and in some varieties may decrease as protein content rises.

Noxious and other bad weeds of Iowa, E. P. SYLWESTER and R. H. PORTER (*Iowa Sta. Bul. P64 (1944), pp. 49–144, illus. 60*).—Practical information is presented on the weed problem, weed classes, characteristics of 52 of the most injurious weeds of Iowa, and principles and methods of weed control involving management and cropping practices, pasturing, burning, and chemicals.

Variations in kinds of weeds from year to year, O. A. Stevens (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, p. 6*).—Russian-thistle, very predominant by 1934, thinned out since 1936 and has not not since become proninent even in the drier parts of the State. Perennial sowthistle, a menace after the wet year of 1916, nearly disappeared during the dry period, probable due to drought, weed control, and grasshoppers, but has been recently reappearing in many places. Marsh yellow cress (*Rorippa palustris*) and the docks (*Rumex spp.*) have shown a direct response to the wetness of last yeear in the Red River Valley.

Nature and rate of development of root system of Apocynum cannabinum, J. C. Frazier. (Kans. Expt. Sta.). (*Bot. Gaz., 105 (1944), No. 4, pp. 463–470 illus. 5*).—The root system of well-established dogbane plants consisted of the original root (primary vertical) and one to many permanent lateral roots which continued to grow horizontally and on which arose roots either growing downward directly, or after short horizontal growth, becoming secondary vertical roots. Plants spread horizontally by means of these permanent lateral roots. Permanent laterals of the first order arose on the primary vertical root. Branch lateral roots (second order) arose on the permanent lateral roots of the first order. In a similar manner permanent lateral roots of the third order arose on those of the second, and those of the fourth order on those of the third, etc. Injury or too severe competition was found to prevent extensive lengthwise growth of lateral roots of any order. Plants spread radially 11.67 ft. and reached a depth of 7 ft. in a growing season of 28 weeks. Source of shoot development, other than from the plumule, was from root-borne buds which produced shoots directly (if at the ground line), or rhizomes (if below ground) which in turn gave rise to leafy shoots. Shoot development of old plants was wholly from root-borne buds. In general type of development, dogbane exhibits certain similarities to and certain differences from field bindweed, hoary cress, and Russian knapweed.

Relation of cultivation to depletion of root reserves in European bindweed at different soil horizons, A. L. Bakke, W. G. Gaessler, L. M. Pultz, and S. C. Salmon. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 4, pp. 137–147, illus. 3*).—Effects of cultivation on root quantity and root reserves (E. S. R., 81, p. 786) in *Convolvulus arvensis* at different depths in the soil was studied at Cherokee, Iowa, 1938–40, on heavily infested land. Excavations 5 by 5 ft. were made to 6- to 8-ft. depths three to four times a year. A high concentration of available carbohydrates (sugars and starch) was present in the lower soil levels and a concentration of roots in the upper levels, respectively increasing and decreasing with depth. Cultivation resulted in a gradual and continuous reduction in the concentration and depletion of the quantity of total available carbohydrates, a decrease in root quantity, and eventually in death of bindweed plants. It first affected concentration of carbohydrates, depletion in root weight being mainly due to loss of carbohydrates. For accuracy the picture of root reserves in bindweed should include both concentration of carbohydrates and root quantities in all soil horizons in which appreciable root quantities exist. Since the greater proportion of roots and available carbohydrates are in the upper layers of soil, a close approximation may be obtained by sampling the upper 2 ft. only. See also a previous note (E. S. R., 91, p. 413).

The herbicidal action of 2,4 dichlorophenoxyacetic and 2,4,5 trichlorophenoxyacetic acid on bindweed, C. L. Hamner and H. B. Tukey. (N. Y. State Expt. Sta.). (*Science, 100 (1944), No. 2590, pp. 154–155*).—Effects of these chemicals when sprayed on bindweed (*Convolvulus arvensis*) and other weeds indicated their possible values as herbicides.

The blackberry or bramble (Rubus fruticosus L.), G. R. W. Meadly (*Jour. Dept. Agr. West. Austral., 2. ser., 21 (1944), No. 1, pp. 17–28, illus. 7*).—Experiments compared effects and costs of different concentrations of various chemicals and results of certain cultural measures in association with pasture establishment. A 5-percent solution of sodium chlorate was the most effective chemical used, but even after application of 625 lb. per acre in five sprayings over 3 yr., a few weak plants still remained. The cost would be prohibitive except for limited areas. Although a weak solution of sodium arsenite had little permanent effect, it caused drying of above-ground portions, thus facilitating the burning of the canes. When blackberry growth is high, destruction or removal of canes is necessary before affected areas can be plowed. Pasture establishment and subsequent judicious grazing, besides being more effective and cheaper than chemicals, increased productivity of a heavily infested area from a negligible quantity to that of a good permanent pasture.

HORTICULTURE

Southern horticulture, H. P. Stuckey (*Atlanta, Ga.: Turner E. Smith & Co., 1944, pp. 688+, illus. 186*).—This comprehensive text, prepared by the director of the Georgia Experiment Station, presents practical information on the growing and handling of fruit and vegetable crops under southern conditions.

Vegetable and small fruit growing in toxic ex-orchard soils of central Washington, C. L. Vincent (*Washington Sta. Bul. 437 (1944), pp. 31, illus. 7*).—An accumulation of water-soluble arsenic in the top 5 or 6 in. of soil in apple orchards that have been sprayed with arsenate of lead for many years has caused a toxic condition which interferes with the agricultural use of the land following tree removal. Studies on established plots in the Wenatchee district showed that vegetable species differed markedly in their tolerance to arsenic. The most tolerant species were asparagus, potatoes, tomatoes, carrots, tobacco, dewberry, grape, and red raspberry. Even these crops were improved when two or more crops of rye were grown and plowed under before the vegetables. Crops with little or no tolerance included snap beans, lima beans, onions, peas, and cucumbers. Some crops, like sweet corn and strawberries, showed considerable tolerance when grown in heavy types of soil. There appeared to be differences in tolerance between varieties within a species.

Cow manure, as well as plowed-under rye, was beneficial in reducing the parts per million of water-soluble arsenic in the soil. Applications of ammonium phosphate reduced the parts per million of soluble arsenic. The author suggests the possibility that certain deep-rooted plants such as grapes, red raspberries, and dewberries are tolerant because their roots are located below the more toxic layers of soil.

Some effects of waxing on weight loss from oranges and certain vegetables, E. G. Hall and S. A. Trout (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 2, pp. 80–82, illus. 2*).—The loss in weight during storage in oranges, carrots, turnips, and cucumbers was reduced by dipping them in a wax emulsion and allowing them to dry by free exposure to the air. With potatoes, there was no significant effect of waxing on weight loss. Assuming that a reduction of 40 percent in the rate of weight loss would be well worth while, a concentration of only 2.5 percent of wax would be satisfactory for oranges. For carrots and turnips the effective wax concentration consistent with cost would be between 7.5 and 10.0 percent. Waxing retarded the yellowing of cucumbers as well as reducing weight losses.

Disease-resistant and hardy varieties of vegetables, V. R. Boswell. (U. S. D. A.). (*Natl. Hort. Mag., 23 (1944), Nos. 2, pp. 59–63; 3, pp. 138–143*).—The author outlines briefly the history of the development of disease-resistant varieties of vegetables, points out their significance to American horticulture, and discusses some of the accomplishments specifically.

Germination of lettuce seed at high temperature stimulated by thiourea, R. C. Thompson. (U. S. D. A.). (*Science, 100 (1944), No. 2589, p. 131*).—Portions of 10 different lots of lettuce seed were soaked in a 0.5-percent solution of thiourea in Petri dishes in darkness in a constant temperature chamber at 18° C. for 7 hr. After treatment, the seeds were washed in tap water and then dried in diffused light. Laboratory tests made 10 days later showed the treated seed capable of strong germination, average 87.2 percent, at 33°–35°. At these same temperatures, untreated seed of the same original lots averaged less than 1 percent germination. Favorable results from thiourea treatment were obtained also with lettuce seed planted in warm soil.

Inbreeding and heterosis and their relation to the development of new varieties of onions, H. A. Jones and G. N. Davis. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 874 (1944), pp. 28, illus. 8*).—From 1922 to 1934 six varieties of onions were inbred for one to six generations. Although in some years certain inbred lines yielded as much as the parental variety, there was in general a decline in production with inbreeding, particularly evident in the first generation. Many of the inbreds were superior to the parents in certain characters, including keeping quality, bolting habit, and uniformity in size, shape, and color. Although vigor could be often increased by crossing inbred lines, quantity production was not feasible because of the need of emasculation. The development of a male-sterile line of Italian Red 13–53 made possible crosses with various commercial varieties without the necessity of emasculation, and one hybrid has been introduced as California Hybrid Red No. 1. The male-sterile character of Italian Red 13–53 has by the technic of backcrossing been incorporated into a number of commercial varieties so that this character can be perpetuated in the seed. Backcross populations of crosses between male-sterile and certain male-fertile lines are always 100 percent male-sterile, and these can be used in the production of hybrid seed. The details of methods of technic are set forth with information of the effects of inbreeding on various characters in several varieties, Yellow Danvers Flat, Yellow Globe Danvers, Ebenezer, Australian Brown, Italian Red, etc.

Control of European corn borer and ear smut on sweet corn with dusts and sprays, B. B. Pepper and C. M. Haenseler (*New Jersey Stas. Cir. 486 (1944), pp. 14*).—The two most important pests of sweet corn in New Jersey are the European corn borer and corn smut. Information is presented on the life history of both of these pests and on accepted methods of control. A most valuable observation was that, despite the fact that the corn borer is an insect and corn smut a fungus, the same spray or dusting materials were effective in control of both. Marked reduction in ear smut was obtained from the use of dusts containing either rotenone or nicotine as the active agent. Equally good results were obtained with power and hand dusters when used properly. The possibility that smut is disseminated by some unknown insect is to be investigated by growing and treating corn plants in the absence of insects.

Selecting tomato varieties for Vermont, C. H. Blasberg (*Vermont Sta. Pam. 10 (1944), pp. 7*).—Accompanied by brief cultural suggestions, information is presented on results of variety tests conducted in the summers of 1942 and 1943.

Influence of phosphorus supply and the form of available nitrogen on the absorption and distribution of phosphorus by the tomato plant, W. S. Breon, W. S. Gillam, and D. J. Tendam. (Ind. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 3, pp. 495–506, illus. 10*).—Tomato plants grown with urea as the source of nitrogen did not develop deficiency symptoms due to a lack of phosphorus as soon as did plants which received nitrate nitrogen. This was true of plants grown at pH 4.8–5.0 and at 6.8–7.0, although the symptoms were slower in developing at the more acid level. Plants furnished urea at pH 6.8–7.0 made much better growth than at pH 4.8–5.0. The uptake of phosphorus was measured by the radioactivity technic. Tomatoes which received urea absorbed P at a greater rate than did plants which received nitrate N. The delay in the appearance of P deficiency symptoms in the urea-supplied plants is attributed to their increased P reserve rather than to a partial breakdown in their nitrate reduction mechanism. P-deficient plants were shown to absorb P at a greater rate than did normal plants grown in the same solution. Apparently the various P compounds of the plant were synthesized in about the same proportions by the P-deficient plant as by the normal plant but at a greater rate.

Speed sprayer is big labor saver; works best on medium high trees, F. N. FAGAN, D. E. H. FREAR, and H. J. MILLER (*Pennsylvania Sta. Bul. 446, Sup. 3 (1944), pp. 2–3, illus. 3*).—The use of a speed sprayer resulted in a crop of fruit almost free from insect damage and with only moderate fungus injury. Labor costs were cut approximately in half, and the materials were applied much more promptly. However, residue tests showed that spray coverage was not as good in the tops as in the lower parts of the trees. The machine is described and its operation discussed.

Physical characters of the skin in relation to apple fruit transpiration, S. A. PIENIAZEK. (R. I. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 3, pp. 529–536, illus. 1*).—In studies with McIntosh, Baldwin, Golden Delicious, and Rhode Island Greening, apple varieties representing a wide difference in transpiration rates, there was observed no well-defined relationship between transpiration rate and thickness of the cuticle. Lenticular transpiration accounted for from 8 to over 25 percent of the total in the four varieties. The lenticels appeared to be more effective in transpiration directly after harvest than later in storage. The number and size of the lenticels was not correlated with the rate of transpiration. Surface russeting increased greatly the rate of water loss. The waxy coating on the skin was found highly important in diminishing water loss. Golden Delicious, with an insignificant wax coating, had a high transpiration rate. Wiping fruits tended to increase water loss by removing some of the surface wax.

Preparing apples for market and their sale, A. E. MURNEEK and H. H. BAKER (*Missouri Sta. Cir. 295 (1944), pp. 20, illus. 5*).—Timely information is given on various factors in the harvesting and handling of apples, including determination of proper stage maturity for picking summer and winter varieties, spot picking, use of preharvest sprays to prevent early dropping, management of the picking crew, removal of spray residues, grading, storage requirements to maintain fruit in good conditions, methods of selling apples, consumer preferences, etc.

The growth of young peach trees under different systems of soil management, A. D. HIBBARD. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 66–70, illus. 1*).—Of a number of types of soil management tried in a young Elberta orchard, those tilled at intervals of about 2 weeks from April 1 to September 1, when a cover of winter rye or barley was sown, made the most growth and those receiving only one cultivation yearly made the least growth. As a group, winter legumes produced larger trees than either summer legumes or mulches. The system employing vetch produced almost as rapid growth as did cultivation. Cowpeas proved best among summer legumes. The poorest growth of all occurred on the permanent lespedeza sod plots. Unfortunately some of the treatments that were most favorable to tree growth result also in severe soil and water losses. It is considered possible that treatments that are unfavorable to young trees may be economical and practical in mature orchards.

Over 100 varieties of peaches in test in station orchard, T. H. JONES (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 8, p. 7*).—A total of 44 varieties fruited in 1944, beginning with the Eubanks variety picked May 24 and closing with Late Elberta on August 10. The more satisfactory varieties for Mississippi are listed.

Ripening Washington-grown Elberta peaches for canning, A. M. NEUBERT and M. K. VELDHUIS. (Wash. Expt. Sta. coop. U. S. D. A.). (*Fruit Prod. Jour. and Amer. Mfr., 23 (1944), No. 12, pp. 357–360, 379, 381*).—Freestone peaches intended for commercial canning in the Pacific Northwest are said to be harvested usually in the firm ripe state and stored until they attain canning ripeness. In studies involving different temperatures and relative humidity conditions, Elberta fruits held at 75° F. developed usually a better flavor than those held at higher or lower temperatures. The flavor of peaches ripened in open boxes at room temperatures (70°–80°) was equal to that of fruit ripened in cabinets at 75°, but such fruit was lighter in color. At 75°, relative humidity did not appear to be critical over a range attained ordinarily in commercial storages in Washington. Rate of ripening was, as expected, accelerated by rises in temperature.

The beach plum, its written record, G. GRAVES (*Natl. Hort. Mag., 23 (1944), No. 2, pp. 73–97, illus. 2*).—This comprehensive account discusses the botany and distribution of the beach plum, the history of its utilization since early colonial times, efforts toward horticultural improvement, chemical composition, literature, etc.

Pruning studies with boysenberries, T. H. JONES (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 8, pp. 1, 2*).—Information is presented on the growth habits and pruning requirements of the boysenberry. Two methods of pruning, (1) in which the fruiting canes are removed after harvest and (2) in which all top growth is cut away following harvest, are under study.

Currant and gooseberry culture in Ohio, W. P. JUDKINS (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 243–245*).—Brief information is presented on varieties, propagation, planting, fertilizers, culture, control of pests, etc.

Relation of the production of an active emanation to respiration in the avocado fruit, H. K. PRATT and J. B. BIALE. (Univ. Calif.). (*Plant Physiol., 19 (1944), No. 3, pp. 519–527, illus. 7*).—Observations on the carbon dioxide evolution of Fuerte and Nabal avocados held at 5°, 15°, and 25° C. (41°, 59°, and 77° F.) showed a very pronounced climacteric at the upper two levels and no well-defined increase at 5° C. Associated with the climacteric rise was the production of an active emanation, presumably ethylene, as indicated by the response of etiolated pea seedlings. Although there was no obvious climacteric rise at 5°, a cycle of emanation production was observed after which the fruit showed a postclimacteric carbon dioxide response when transferred to a higher temperature. Treatment of preclimacteric fruit with ethylene caused an earlier onset of the climacteric rise and more uniform softening.

Studies on nutrition as qualified by development in Musa cavendishii Lambert, W. A. T. SUMMERVILLE (*Queensland Jour. Agr. Sci., 1 (1944), No. 1, pp. 1–127, illus. 45*).—As a basis for sound fertilizer treatments studies were made of the growth and fruiting habits of the Cavendish banana. The number of leaves produced in a given period is governed largely by climate, but the area of leaf surface is an index to nutritional status. The development of the plant was divided into three stages, (1) purely vegetative increase, (2) in which both floral and vegetative parts are produced, and (3) devoted largely to the maturation of the fruit. Valid comparisons between plants can be made only when they are in the same developmental stage. For most questions involving nutrition, banana plants yield as much information within about 3 mo. from planting as during their entire life. Various climatic factors were found to play an important role in determining both rate of development and number of fruit. Age of plant was also shown to affect the number of fruits. Climatic effects must be assessed in measuring the effect of fertilizers. A fertilizer may have an adverse effect on yield by causing the plant to develop its fruit in an unfavorable part of the year. Time of planting may also influence yield. Potassium accelerated development while nitrogen and phosphorous had no quantitative effects.

Citrus research in Southern Rhodesia, W. J. Hall (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 164–166*).—A general survey, including diseases and insect pests and soil problems.

Effects of rootstock and environment on the composition of oranges and grapefruit, W. B. Sinclair and E. T. Bartholomew (*Hilgardia [California Sta.], 16 (1944), No. 3, pp. 125–176, illus. 18*).—Over a period of 7 years, observations were made on the composition of fruits of Valencia and Washington Navel oranges and Marsh grapefruit grown on various rootstocks and under different environments. Based on changes in soluble constituents, it was found that Valencia oranges grown at Riverside (inland) matured slightly in advance of those grown at Tustin (coastal district). Apparently the additional amount of sunshine and higher average temperatures at Riverside favored increased photosynthetic activity and consequent accumulation of carbohydrates. With all three varieties, the highest amount of chemical substances in peel, pulp, and juice of the fruit was found, usually, in samples from trees on Morton and Savage citrange and trifoliate orange rootstocks. The lowest contents were recorded in fruits from trees on rough-lemon stock. Total sugars and acids, as percentages of the total soluble solids in the juice of fruit samples from the different rootstocks, bore no relation to the mineral constituents. There was a high correlation between total soluble solids and total sugars in both the Valencia and Washington Navel oranges. The fraction of total soluble solids existing as total sugars was not influenced by the rootstock. The dry matter, as a percentage of the fresh weight, was significantly higher in the peel, pulp, and juice of Valencia fruits from Riverside than in those from Tustin. The total ash, on a dry-weight basis, in peel, pulp, and juice was about the same in fruit from both places. In grapefruit the mean dry matter and total ash were significantly higher in the peel and pulp of Brawley-grown than in Riverside fruit. Information is offered on the distribution of inorganic materials such as calcium and magnesium.

FORESTRY

Forest land ownership in Louisiana and its influence on timber production, A. D. Folweiler (*Louisiana Sta. Bul. 377 (1944), pp. 56+, illus. 7*).—Title to the forest land of Louisiana is held largely by private owners with only about 12 percent under control of public agencies. The task of increasing the fund of lumber in the State rests, therefore, mainly with private owners. Louisiana forest lands can be grouped into three important types: (1) Loblolly-shortleaf, (2) longleaf-slash, and (3) Mississippi bottomland hardwoods. There are in the three types, respectively, approximately 3,000, 1,000, and 3,000 ft. board measure of sawlogs per average acre.

In the nine parishes that were studied intensively there were almost 16,000 owners who held title to slightly more than 3,000,000 acres of forest land. The average areas held per owner in the above three types were respectively, 150, 213, and 630 acres. The task of increasing Louisiana timber is made difficult by the small holdings and the heterogeneous nature of forests. Little use has been made of the Reforestation Tax Act of 1924.

Particular attention was devoted in the study to the loblolly-shortleaf pine type of forest land. In 1943, this type was producing at less than one-half its potential capacity. However, the complicated ownership picture makes difficult the development of a unified plan for managing such areas. The State has a social responsibility in reconciling the divergent views of forest landowners. A plan is set forth for achieving this objective. The situation on the longleaf-slash pine and bottomland hardwood types of forest land are also discussed, and plans for improvement are set forth.

A ten-year ecological study of adjoining grazed and ungrazed woodlands in northeastern Ohio, C. A. DAMBACH. (Ohio State Univ.). (*Ecol. Monog., 14 (1944), No. 3, pp. 255–270, illus. 9*).—In the 10 years following discontinuance of grazing in a sugar maple woodlot in Geauga County, Ohio, there was a marked restoration in the flora and fauna population and an increase in economic returns as compared with an adjacent area upon which pasturing was continued. Seedling trees became established in large numbers in the third season following fencing. In the eighth growing season there were nearly 80,000 seedling trees per acre in the protected area. Sugar maple seedlings dominated, but there were 18 other species present in small numbers. The development of herbaceous and shrubby species followed a similar pattern and there was a notable increase in leaf litter in the ungrazed area. Birds and mammals also increased in number and kinds. The average yearly income from the sale of maple products was $10.67 more per acre in the protected than in the grazed areas.

Volunteers in Ohio forest plantations, R. R. PATON. (Ohio Expt. Sta.). (*Jour. Forestry, 42 (1944), No. 6, pp. 420–422, illus. 2*).—A survey of over 2,500 plantations in various parts of Ohio showed that 76 percent had volunteers averaging 541 per acre. The number of volunteers tended to increase up to 25 yr. of age, after which there was a decrease. One of the chief factors involved in the establishment of volunteers was the availability of seed. The species of volunteers varied greatly in relative abundance in the different regions of the State, with elm, cherry, hawthorn, white ash, and sugar maple taking the lead for the State as a whole. Birds and wind ranked high as distributors of seed.

Watering plantation trees, R. H. WEIDMAN and C. R. BERRIMAN. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry, 42 (1944), No. 6, pp. 435–437*).—Distinct advantage was obtained from watering plantations in the foothills of the Sierra Nevada range, where summer rainfall was almost zero. Mulching with needle litter was valuable as a supplement to watering, particularly to moderate or light watering. Although the watering of extensive forest planting is not feasible, it is believed that watering during the first season would be worth while in the case of farm forests, windbreaks, erosion-control plantings, and arboretums.

Tree planting and soil erosion control in the Southwest, R. E. WILSON. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 9, pp. 668–673*).—At the head of the list of trees for planting in the Southwest for soil erosion control is the native cottonwood, on account of its hardiness and resistance to drought. Where there is sufficient water, willows rank high because of their rapid early growth. The best willow is *Salix fragilis,* which is capable of making 6 to 8 ft. of growth per year in its early period. The Russian-olive has much value because of rapid growth, resistance to alkali, and capacity to form thick sturdy stands. The evergreen tamarisk, or Athel tree, of Mediterranean origin has much promise wherever an adequate supply of water is available. On the other hand eastern species such as elm, locust, ash, wild plum and Osage-orange are not promising in the Southwest because of slow growth and difficulty to establish.

Influence of aspen, young lodgepole pine and open grassland types upon factors affecting water yield, E. G. DUNFORD and C. H. NIEDERHOF. (U. S. D. A. coop. Colo. State Col.). (*Jour. Forestry, 42 (1944), No. 9, pp. 673–677, illus. 2*).—Conducted in 1942 and 1943 on the Fraser National Forest in north-central Colorado, this study indicated that from the standpoint of water available for streamflow, aspen and grass are probably superior to a dense coniferous forest. As compared with a dense stand of young pine, the aspen and open grassland types intercepted smaller amounts of precipitation. Erosion was no problem in any of the three types provided they received proper protection from misuse. Where water yield is the primary consideration, conversion to a coniferous forest by costly reforestation methods is scarcely justified.

Slash pine produces viable seed north of its natural range, D. B. ROSENKRANS. (Clemson Agr. Col.). (*Jour. Forestry, 42 (1944), No. 9, p. 685*).—In 1925 some 580 slash pine seedlings were planted at Clemson College, S. C. In 1942 a few small but mature seed-producing cones were collected, but yielded no viable seed. Collections in 1943 yielded some seed of fairly good germination. Thus slash pines growing 140 miles north of the natural range of the species were capable of reproduction.

Immersing seeds of species of Robinia in boiling water hastens germination, J. K. WILSON. (Cornell Univ.). (*Jour. Forestry, 42 (1944), No. 6, pp. 453–454*).—Seeds of the rose acacia (*Robinia hispida*) and of the clammy locust (*R. viscosa*) were submerged in boiling water for different periods. In the case of the rose acacia, immersion for 1 min. increased germination after 7 days from 0 to 80 percent. Immersion for 5 min. did not injure the seed. Favorable results were obtained also with the clammy locust seeds immersed in hot water for 1 min.

Two factors affecting rooting of red maple cuttings, L. J. EDGERTON. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 9, pp. 678–679*).—Greenwood cuttings taken from the lower half of the crown of young red maple trees, 10-20 ft. in height, rooted more readily than those from the upper half. The fact that cuttings from light fruiting female trees gave as high a rooting percentage as those from male trees indicated the absence of any genetic relationship to rooting capacity.

Dunkeld larch in Ohio, R. R. PATON (*Jour. Forestry, 42 (1944), No. 6, pp. 452–453*).—Two stocks of the Dunkeld larch designated as Glamis and Atholl were sown at Wooster, Ohio, in the spring of 1931. The germination and growth of the Glamis larch was better from the start, and measurements on established plantings showed this difference to be maintained for several years. The Dunkeld larch made better growth than either of its parents, namely, the Japanese and European larches, planted nearby. However, this superiority was not enough to suggest that the Dunkeld larch will become an important factor in Ohio.

Effect of fertilizer on planted black locust, D. DENUYL. (Ind. Expt. Sta.). (*Jour. Forestry, 42 (1944), No. 6, pp. 450–451*).—Seedlings planted in the compact subsoil left after erosion on a typical Bedford silt loam were supplied with a 2–12–6 fertilizer placed in the holes at time of planting. Survival was excellent in all treatments, which consisted of 0.5, 1.0, and 2.0 tablespoonfuls of fertilizer per tree. In the first season the fertilized trees had larger leaves, better color, and made better growth. Measurements in 1942 on trees planted in 1939 showed average heights of 15 and 10 ft. for the fertilized and unfertilized trees, respectively. Diameter growth was also notably increased by fertilization.

Ecotypic differentiation in red ash, J. W. WRIGHT (*Jour. Forestry, 42 (1944), No. 8, pp. 591–597*).—In this second paper (see above) further information is presented on the variations in ash seedlings grown in Massachusetts from seeds received from various localities in the eastern United States and Canada. The more rapid growing characteristics of the southern stock was offset by its lack of winter hardiness when grown in the north.

Genotypic variation in white ash, J. W. WRIGHT (*Jour. Forestry, 42* (*1944*), *No. 7, pp. 489–495*).—Observations on young plants grown from seeds obtained from 28 localities in United States and Canada and sown in a nursery in the Harvard Forest, Petersham, Mass., showed the presence of at least three ecotypes. The northern ecotype from Pennsylvania to Michigan, New England, and northward had diploid, $2n = 46$, chromosomes. These seedlings were resistant to winter injury in their first year. The southern and intermediate ecotypes contained a diversity of chromosome numbers, diploids, tetraploids, and hexaploids, and plants from southern seed were subject to severe winter injury. The intermediate ecotype, from the region of southern Pennsylvania and Ohio, suffered moderate winter injury. There is indicated the need of using northern-produced seed for northern plantings, and probably local seed would be desirable also in the southern region.

Chemical composition of leaves in different parts of sugar maple trees, E. F. WALLIHAN. (Cornell Univ.). (*Jour. Forestry, 42* (*1944*), *No. 9, p. 684*).—In late August 1941 three sugar maples of 50-, 42-, and 42-ft. heights were cut in the Arnot Forest, N. Y. Leaf samples collected from the three trees were analyzed, and the results showed small but real differences between basal and tip leaves on a given twig with respect to percentage nitrogen and potassium contents. Leaves from the tops of the trees contained slightly lower percentages of nitrogen than did other leaves.

The most variable element was calcium, but no consistent trends were indicated. The data suggest that a random sample of 50 to 100 leaves from the most accessible part of a tree would constitute a representative sample.

Growth response in sugar maple following light selective cutting, W. M. ZILLIGITT. (U. S. D. A.). (*Jour. Forestry, 42* (*1944*), *No. 9, p. 680*).—Light selective cutting in a stand of sugar maple ranging from 10 to 23 in. d. b. h. and located in an experimental forest near Dukes, Mich., accelerated growth but did not change the form of the trees. The latter fact means that diameter measurements are a satisfactory index to growth and will give a reliable picture of performance following treatments.

Cutting cycles in ponderosa pine, G. A. PEARSON. (U. S. D. A.). (*Jour. Forestry, 42* (*1944*), *No. 8, pp. 575–585, illus. 7*).—A study of records taken on five large sample plats logged 30 or more years ago and measured periodically since that time showed that the rate of net increment rose during the first 10 yr. after cutting and then declined so that in the third decade a level about 50 percent below that attained in the first decade was reached. When the trees that were 12 in. or above in diameter at the beginning of the record were separated from those that subsequently attained the 12-in. class, the decline of the former group was still greater. Mortality was only one of several contributing factors, with weakening by mistletoe, squirrel defoliation, and lightning injury important. Overstocking was also a cause. More frequent improvement cuttings appeared desirable.

Conservation rides timber trail in Turtle Mountains, W. H. PAUL and E. L. WORTHINGTON (*U. S. Dept. Agr., Soil Conserv., 10* (*1944*), *No. 1, pp. 13–15, illus. 5*).—An account is presented of the organization and operation of a cooperative association formed to handle and market woodland products in northern North Dakota.

Observations on the visibility of a small smoke, H. D. BUCK. (U. S. D. A. coop. Univ. Calif.). (*Jour. Forestry, 42* (*1944*), *No. 6, pp. 426–434, illus. 5*).—Results of observations on a large number of standard small smokes given off by a smoke candle showed that under the best of conditions, namely, clear air, uniform dark background, and small angle, the sun being low behind the smoke, the maximum distance of visibility was somewhat less than 24 miles. The range decreased to varying extents with higher angles, lighter backgrounds, and hazier air. For a given haze concentration, smoke visibility against uniform backgrounds appeared to vary directly with the angle of illumination of the sun.

DISEASES OF PLANTS

The Plant Disease Reporter, [August 1, 7, and 15, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 23, pp. 737–771; 24, pp. 773–807, illus. 5; 25, pp. 809–822, illus. 2*).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals and grasses, field legumes, potatoes, vegetables, fruits, special crops (e. g., fiber, sugar, tobacco), and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 23.—Survey of microflora of wheat seed from Minnesota, North Dakota, and South Dakota, by I. W. Tervet; flax disease survey in Minnesota and North Dakota, by H. H. Flor; cereal smut survey in Nebraska, by S. M. Pady; stem rust of wheat in the Dakotas, with notes on other wheat diseases, by I. W. Tervet; occurrence of potato late blight and other downy mildews in Massachusetts, by O. C. Boyd; carrot diseases in Idaho in 1943, by E. C. Blodgett; and the scab disease of violets, by H. H. Whetzel.

No. 24.—Observations on X-disease and other diseases and injuries on peach in eastern New York, by D. H. Palmiter; virus and other diseases of stone fruits in western Colorado, by E. W. Bodine; diseases observed on stone fruits in central Washington, by L. W. Boyle; diseases and injuries reported on sour cherry in Wisconsin, by E. E. Honey, D. Moore, and C. Calavan; the dwarf bunt disease of wheat in Idaho in 1943, by E. C. Blodgett; damage by smuts to small grains in Illinois in 1944, by L. R. Tehon and G. H. Boewe; cereal disease survey in Nebraska, by S. M. Pady; cereal diseases in Montana, by C. M. Slagg; cereal diseases in Colorado, by E. W. Bodine; potato diseases in the Red River Valley and in east-central Minnesota, by I. W. Tervet; and tomato diseases in eastern Missouri, by T. W. Bretz.

No. 25.—Summary of the tomato disease survey in central California, by H. L. Barnett; potato late blight survey in Weld County, Colo., by E. W. Bodine; purple top wilt of potato and the aster yellows virus in the Dakotas, by I. W. Tervet; and onion diseases in New York, by J. Niederhauser.

Twenty-third annual report of the Canadian Plant Disease Survey, 1943, I. L. Conners and D. B. O. Savile (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt., 23 (1943), pp. 122+, illus. 3*).—Much the same general plan is followed as in previous issues (E. S. R., 81, p. 796; 89, p. 681), but in this case the section on new and noteworthy diseases is presented in French (by R. O. Lachance) as well as in English.

[Abstracts of bacteriological papers] (*Jour. Bact., 48 (1944), No. 1, pp. 122–123*).—Growth of Some Animal Pathogens on Wheat Roots (p. 122), and Growth and Overwintering of Plant Pathogenic Bacteria on Wheat Roots (pp. 122–123), both by S. Diachun and W. D. Valleau (Ky. Expt. Sta.).

The generic names of bacterial plant pathogens, N. H. White (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 2, pp. 78–79*).—The generic names used under four systems of nomenclature (Migula, Smith, Bergey, Dowson) are tabulated and discussed, and the chief points believed to favor the last are presented. The generic naming suggested by W. J. Dowson for bacterial plant pathogens (*Corynebacterium, Bacterium, Pseudomonas, Xanthomonas*) has been adopted in Tasmania, and a key to these amended genera developed by the author and used successfully during the past season is appended here.

The term viruliferous, E. Carsner. (U. S. D. A.). (*Phytopathology, 34* (*1944*), *No. 8, pp. 765–766*).—The author recommends that the term "viruliferous" be restricted to mean the status or condition of an insect vector in which it carries a virus. Its use to describe plant tissue containing virus or virus-infected plants is discouraged.

Nutrient interrelations in lime-induced chlorosis, R. C. Lindner and C. P. Harley. (U. S. D. A.). (*Plant Physiol., 19* (*1944*), *No. 3, pp. 420–439*).—Lime-induced chlorosis of plants is distinguished from other types of iron chlorosis such as true Fe deficiency, upset Mg/Fe balance, and upset phosphate/Fe balance. Leaves affected with lime-induced chlorosis proved to be high in K but somewhat low in Ca and Mg, and it was not definitely established whether these nutrient relations are associated with the cause or are a result of chlorosis. Data are presented on the distribution of Ca, K, Mg, P, Fe, and Mn in various fractions of green and chlorotic pear and apple leaves and of green and variegated spiraea leaves. The K was mostly water-soluble; Mg and Mn were either water-soluble or readily dissociated by 0.1 N HCl (except for the small amount of Mg present in the ether fraction as part of the chlorophyll molecule); Ca, P, and Fe, on the other hand, were distributed more generally in all fractions. Over half the Fe in the leaves examined was in a form insoluble in 1 N HCl, presumably as Fe-hematin, Fe-nucleoprotein, or other complex organics. Neither the total nor insoluble Fe nor that soluble in water, ether, alcohol, 1 N acetic acid, 1 N NH_4OH, 0.1 N HCl, or 1 N HCl was correlated with lime-induced chlorosis. Likewise, electrodialyzable Fe could not be so correlated. The Fe extracted by 0.5 N HCl was low in chlorotic leaves; the HCl had probably removed the Fe from an enzyme playing a role in chlorophyll formation. Lime-induced chlorosis is believed to be caused by a complex of causes whose interrelations are not yet fully established. The data suggest that a relatively high K level induces chlorosis by replacing Fe on the enzyme responsible for chlorophyll formation, thereby inactivating the enzyme. There are 33 references.

The relation of some chemical and physico-chemical factors to the initiation of pathological plant growth, A. J. Riker. (Univ. Wis.). (*Growth, 6* (*1942*), *Sup., 4. Symposium Devlpmt. and Growth, pp. 105–117, illus. 3*).—This paper was presented at the Fourth Symposium on Development and Growth. For studying the factors associated with pathological plant growth, the author's attention has been centered on crown gall (*Phytomonas tumefaciens*) and on comparable nonparasitic growths. Among the important factors bearing on this problem and studied intensively are those concerned with (1) loss in pathogenicity of the cell-stimulating bacteria induced by various amino acids, (2) recovery of their pathogenicity in certain media and after ultraviolet treatment, (3) "oxygen hunger" of plant cells, (4) changes in osmotic pressure which may cause swelling of the plant cells, and (5) the presence of unusual quantities of enzymes and of growth substances—e. g., thiamine, riboflavin, pantothenic acid, and biotin, (6) of bacterial metabolites—e. g., NH_3, phosphatides, phospholipids, and polysaccharides—that "irritate" plant cells, and (7) of food materials in abnormal amounts. When some of these and other important factors are present in unusual combinations and proportions, living cells commonly begin to enlarge and multiply. While continuing to examine individual factors, the investigator may well consider from the evidence available that the initiation of pathological growth may be associated with an unbalanced combination of some such important physiological factors. There are 22 references.

Distribuição teórica de lesões em folhas ou frutas, causadas por insetos e outros animais ou por agentes infecciosos transmitidos por vetores (Theoretical distribution of lesions on leaves and fruits caused by insects and other animals or by agents transmitted by animal vectors), A. A. Bitancourt (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 243–252; Eng. abs., pp. 251–252*).—When lesions on leaves and fruits are produced by infectious agents randomly distributed on the surface of the organs, a Poisson distribution of the number of leaves or fruits with 0, 1, 2, 3, . . . *k* lesions is observed, provided the number of agents is not large. If, however, lesions are produced or transmitted by an insect, for instance, a single individual may produce more than one lesion and the distribution, if the insects are randomly distributed, is given by expansion of the polynome P_n (a + b + c + d + . . . ^{n}, where p_n is the probability of there being n vectors on any leaf, as given by the Poisson distribution, and a, b, c, d, . . . the probabilities of any insect producing 1, 2, 3, 4, . . . lesions per leaf. An example is given of sweet orange leaves having lesions of leprosis, with detailed discussion. It is pointed out that a statistical study of the distribution of discrete lesions on leaves or fruits in virus diseases may lead to the discovery of whether the disease in question is systemic or is locally transmitted by a vector. In the first case the distribution may often be expected to follow the Poisson distribution; in the second, it is thought more likely to be the one discussed in this paper.

Diseases and pests of cereals, fibre, forage, and root crops, W. R. Foster (*Brit. Columbia Dept. Agr., Field Crops Cir. 17 (1942), pp. 52, illus. 13*).—An informatory manual, including control measures.

Studies on the life history of the club root organism, Plasmodiophora brassicae, G. W. Ayers (*Canad. Jour. Res., 22 (1944), No. 4, Sect. C, pp. 143–149, illus. 27*).—Attention was focused principally on zoosporangium development and formation and discharge of zoospores. Resting spores, released from thoroughly clubbed tissues by the action of bacteria and fungi, germinated well in tap water at room temperature in 1–10 days; the process was hastened by exposure to frost. Zoospores from the resting spores were biflagellate and heterokont and varied in size. On contact with root hairs or epidermal cells of cruciferous seedlings they settled as amebas and penetrated the cell wall to form young thalli within the host cells. The thallus may or may not become considerably enlarged before the protoplasm undergoes cleavage and an irregular cluster of enlarged zoosporangia is formed. Each zoosporangium contained 4–8 zoospores which, at maturity, were discharged from the root hair in the presence of free moisture; otherwise the fungus protoplasm disintegrated. At ordinary field temperatures, 4–6 days were required from host infection to zoospore discharge. Discharge occurred through small openings at the point of contact of the zoosporangia with the cell wall of the root hair. These zoospores when discharged were not over half the average diameter of the zoospores from germinating resting spores. Temperatures most favorable for growth of the host proved also most favorable for infection. The cardinal temperatures for infection were 54°–57°, 70°, and above 92° F.; only 2–2.5 days were needed for the process.

Acquired immunity from curly top in tobacco and tomato, J. M. Wallace. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 5, pp. 187–214, illus. 9*).—Cultivated varieties of tomato became severely diseased and eventually died when infected with this virus either via leafhoppers or grafting with other tomato plants infected by leafhopper vectors. If, on the other hand, they were grafted with Turkish tobacco plants that had recovered from severe stages of curly top, the tomato plants frequently acquired an immunity similar to that in recovered tobacco. Since the tomato plants rarely initiated the recovery reaction, this transfer of immunity may be considered a type of "passive immunization." By using Turkish tobacco it became possible by graft transfer to immunize tomato plants against individual virus strains. Clonal plants propagated from the immunized tomato plants exhibited a wide variation in response, depending on the virus strain used and ranging from vigorous, at times symptomless, plants to a condition of low vigor and conspicuous curly top symptoms. Tomato clones immunized by single strains of the virus, when tested by reinoculation superimposing different virus strains, showed a high degree of protection against some strains and less against others. These reactions indicated a definite specificity of immunization similar to known reactions from animal viruses. This study has manifested the following phenomena: Regularly occurring recovery in tobacco; acquired resistance of recovered plants to injury from reinoculation; persistence in recovered plants of curly top virus not lessened in virulence; evidence of a time factor in the reactions leading to recovery and that this recovery and acquired resistance does not result from invasion of embryonic tissues; proof of transfer by grafting of this condition of acquired immunity from a recovered plant, not only as an intraspecific transfer (tobacco to tobacco) but also as an interspecific passage (tobacco to tomato varieties that rarely initiate the recovery reaction); and, finally, evidence of a striking specificity exhibited by different strains of the virus. This whole range of evidence indicates the phenomena to be immunologic in nature.

Notes on seed-borne fungi.—I, Stemphylium, J. W. GROVES and A. J. SKOLKO (*Canad. Jour. Res., 22* (*1944*), *No. 4, Sect. C, pp. 190–199, illus. 11*).—Three species isolated from agricultural seeds are described and illustrated, viz, *S. sarcinaeforme, S. botryosum,* and *S. consortiale* n. comb. The first was found only on red clover seeds; the other two, on a wide variety of seeds. The perfect stage of *S. botryosum* is *Pleospora herbarum;* that of the other two is unknown.

Cuscuta japonica Choisy, an Asiatic species new to America, T. G. YUNCKER (*Torreya, 44* (*1944*), *No. 2, pp. 34–35*).—Until recently, there have been only four foreign species of dodder of economic significance known to have been introduced into the United States. Specimens of a fifth species—*C. japonica*—have been received by the author from Texas and Florida, in both cases on kudzu. From notes accompanying the Florida material it seems apparent that this species will be able to parasitize native American plants; there is little doubt but that it would spread if allowed to become established in a favorable environment.

Estudos sobre a transmissão experimental da "clorose infecciosa" das Malváceas (Studies on the experimental transmission of the "infectious chlorosis" of Malvaceae), K. SILBERSCHMIDT (*Arq. Inst. Biol.* [*São Paulo*], *14* (*1943*), *pp. 105–156, illus. 14; Eng. abs., pp. 153–154*).—The results are given of observations and experiments on the transfer of the virus disease of *Sida acuta carpinifolia, S. rhombifolia,* and *S. cordifolia,* and of two ornamental shrubs, *Abutilon striatum* and A. *striatum spurium.* In the tests recorded, transmission by seed or sap inoculation was unsuccessful with *Sida;* in graft unions, however, the virus passed easily from diseased to healthy component, infection was carried more rapidly in basipetal than in acropetal directions, and a union of only 2 days was sufficient to permit passage of the virus from diseased to healthy component. Submitting the infected scion to high temperatures before grafting delayed the appearance of symptoms in the stock. In interspecific grafts, healthy stock of *S. rhombifolia* became infected easily from diseased scions of all three species of *Sida;* but stocks of *S. acuta* exhibited more severe symptoms after being infected from the same species than from *S. rhombifolia;* similar differences were noted with the reverse type of graft. In intergeneric grafts, diseased scions of *A. spurium* carried the typical disease to stocks of *S. rhombifolia,* but only extremely weak symptoms appeared in stocks of *S. acuta carpinifolia.* The reverse transmission—from diseased *Sida* to healthy *Abutilon*—was observed in only a few cases. It is concluded that the agents of infectious chlorosis in the different species of the Malvaceae are identical, but that the virus in some cases becomes attenuated by passing through the contact zone between stock and scion of heteroplastic grafts. Possible causes of the differences in virulence are discussed. There are 21 references.

Estudos sobre adesivos da calda bordaleza [Studies on adhesives in bordeaux mixture], M. KRAMER and A. C. DE ANDRADE (*Biológico, 9 (1943), No. 9, pp. 317–330, illus. 2; Eng. abs., pp. 329–330*).—Preliminary experiments are described in which 12 different adhesives incorporated in bordeaux spray were tested on potato plants in the State of São Paulo, Brazil, results being interpreted in terms of fungicidal value, visibility of the fungicide on the foliage, adhesiveness, foliage injury, and cost. Since there was no spontaneous infection with either early or late blight, fungicidal value could be established only in terms of increased potato yields; significant differences are reported as compared with unsprayed controls. The most important criterion of adhesiveness is believed to be the proportion of copper remaining on the foliage; cassava flour, fish oil, and starch gave a Cu residue significantly greater than controls sprayed with bordeaux alone. No significant differences were found for powdered soap, kaolin, and casein 120; glue, resin soap, casein 60, milk, and molasses proved inferior to plain bordeaux. A significant statistical interaction was obtained between treatments and rainfall because of the fact that some of the adhesives proving superior under low were not as good under heavy precipitation; in the latter case fish oil was superior to all other treatments. Foliage injury was more pronounced on the Eigenheimer than on the Konsuragis variety; greatest injury followed use of resin soap, casein, and milk.

Effect of penicillin on a plant pathogen, J. G. BROWN and A. M. BOYLE. (Univ. Ariz.). (*Phytopathology, 34 (1944), No. 8, pp. 760–761, illus. 1*).—In petri dish tests, penicillin suppressed the gram-positive *Erwinia carnegieana*—cause of extensive destruction of giant cactus (E. S. R., 87, p. 243)—as it did *Staphylococcus aureus*—the test organism used in experiments with the penicillin drug. There were also indications that the gram-positive *Corynebacterium sepedonicum* is also susceptible to its action.

Some factors influencing the toxicity of ozone to fungi in cold storage, R. D. WATSON. (Cornell Univ.). (*Refrig. Engin., 46 (1943), No. 2, pp. 103–106, illus. 1*).—On the basis of experimental data presented, it is concluded that "in general the relationship of concentration × the time of application = constant [*K*] probably holds over a small range of concentration, but this relationship did not hold over the range of concentrations and length of times used in the experiments reported. In these experiments the minimum *K* value was obtained when a concentration of 14 p. p. m. was used and was increased both at higher and at lower concentrations of ozone. The *K* value has little direct comparative application between investigators' results, since it reflects the method of application of ozone, the test medium used, and probably other variable factors. The apparent toxicity of ozone to fungi decreased as the depth of the media and the amount of organic materials in the media increased. The unbroken epidermis of apples did not reduce the killing power of ozone. Temperature variations from 3° to 34° C. had very little influence on the toxicity of ozone to *S[clerotinia] fructicola* spores."

Stem rust of wheat and its control by breeding resistant varieties, W. P. CASS SMITH and A. J. MILLINGTON (*Jour. Dept. Agr. West. Austral., 2. ser., 21 (1944), No. 1, pp. 1–16, illus. 6*).—Reference is made to the latest epidemic in Western Australia and the serious but infrequent incidence of the disease in the past. The rust problem of the first settlers and the production of rust-escaping varieties by the early Australian breeders are described, and the current breeding work in Western Australia is summarized, including the combination in one variety of the Kenya C. 6041-type resistance with the Hope type possessed by Warigo, which is believed to insure as much as possible that in the event of a new race of rust arising which can attack either parent the variety will remain resistant. Although not rust resistant in the sense of Kenya and Hope varieties, Kondut—a recent Western Australian production—is said to be less affected by rust than are Bencubbin and Nabawa. Among other matters considered are the physiologic races, the carry-over of the disease, and weather conditions in relation to epidemics.

Rust inhibitor. (Univ. Minn.). (*Northwest. Miller, 219 (1944), No. 6, pp. 1a, 6a–8a, illus. 4*).—A review of the work of E. C. Stakman, with especial reference to stem rust of wheat.

Fungicides for snow mold control, O. J. Noer (*Greenkeepers' Rptr., 12 (1944), No. 3, pp. 13–14, 24–25, illus. 4*).—Several years' tests of substitutes for the $HgCl_2$ treatment for snow mold—carried out in the Milwaukee, Wis., area—are summarized. Far-reaching conclusions were believed unwarranted, but indications were that Calo-Clor, Thiosan, and DuBay 1205–J are the best materials for controlling this turf disease. Less effective was ZnO, alone or with $Ca(OH)_2$, there being no evidence of control; Special Semesan was the next least effective material tried; manganese dimethyl dithiocarbamate gave some control; Spergon, dry or wettable, did not appear promising.

Varietal resistance to halo blight in beans, T. D. Raphael and N. H. White (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 2, pp. 76–77*).—The results of a test of 12 varieties are tabulated and briefly discussed.

Soil-inhabiting fungi attacking the roots of maize, W.-C. Ho. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 332 (1944), pp. 401–446, illus. 6*).—During this study the organisms found most often on decayed seeds were *Pythium debaryanum, Gibberella saubinetii, Penicillium oxalicum, Trichoderma lignorum,* and *Fusarium* spp.; on diseased roots, *Pythium debaryanum, P. graminicola, G. saubinetii, Helminthosporium sativum, Rhizoctonia solani, T. lignorum, F. moniliforme,* and *Fusarium* spp.; on mesocotyls, chiefly *G. saubinetii, R. solani, H. sativum, Penicillium oxalicum, T. lignorum,* and *Fusarium* spp.; on plumules, *G. saubinetii, Fusarium* spp., and *Rhizopus* sp.; and on crowns, *Diplodia zeae* and *F. moniliforme.* The fungi may be divided into three groups on the basis of pathogenicity to corn in greenhouse and field: (1) Highly destructive, *Pythium debaryanum, P. graminicola,* and *G. saubinetii;* (2) moderately destructive, *R. solani, H. sativum, D. zeae,* and *Penicillium oxalicum;* (3) slightly destructive, *Aspergillus niger, F. moniliforme, T. lignorum, Rhizopus* sp., and *Fusarium* spp. *Pythium debaryanum* was responsible for heavy seed decay, particularly with soil temperatures below 16° C. and moisture abundant. *G. saubinetii* and *P. graminicola* were also capable of causing considerable decay where *P. debaryanum* was scarce or inactive. Initial root infection was caused by *P. debaryanum* and *P. graminicola. G. saubinetii* often caused reddish brown to dark red necrotic lesions on the remaining portions of the roots but more characteristically produced discoloration and rot of the mesocotyl. Most strains of *H. sativum* were only slightly pathogenic, but one strain repeatedly produced a brownish black discoloration and rot of the mesocotyls and roots. Except for a strain of *Rhizoctonia solani,* the other fungi proved to be either secondary invaders or saprophytes.

In general, the combination of two active pathogens, such as *P. debaryanum* with *G. saubinetii,* seemed to increase the disease severity. Combinations of an active pathogen with a nonpathogenic or saprophytic form sometimes decreased the severity of the injury as compared with that produced by the active pathogen alone.

During the last half of May, *P. debaryanum* became parasitic before and after emergence, causing seed decay, stunted growth, and tip necrosis on the primary and some of the seminal roots. As the season advanced and the soil temperature was higher, *P. graminicola* became aggressive and induced a rapid necrosis on the tips of most of the roots. At the same time *G. saubinetii* and *R. solani* often occurred on the lower part of the mesocotyl and later caused a discoloration and necrosis of the roots. Later in the season other organisms such as *H. sativum* and *Penicillium oxalicum* produced further necrotic lesions on the mesocotyl and basal portion of the roots. Still later in the sequence, *Fusarium* spp., *A. niger, T. lignorum,* and other saprophytic soil-inhabiting organisms were isolated from the root and mesocotyl lesions; this group often developed extensively in the seedlings, leaving no evidence of the organisms that had prevailed earlier.

Resistance of guayule to the root-knot nematode, W. G. HOYMAN. (Univ. Ariz.). (*Phytopathology, 34 (1944), No. 8, pp. 766–767*).—Guayule transplants were set out in the field and greenhouse in soil known to be heavily infested with *Heterodera marioni.* When grown as long as 19 mo. in such soil, the plants showed only very slight infestation, indicating a high resistance to this nematode.

Experiments with pea seed treatments in Colorado, J. L. FORSBERG, E. OLSON, and A. M. BINKLEY. (Colo. Expt. Sta.). (*Phytopathology, 34 (1944), No. 8, pp. 753–759*).—Treatment with Spergon, New Improved Ceresan, Arasan, or Yellow Cuprocide usually gave increased stands in the three pea-growing sections where tried. Although the first two gave best results in the majority of tests, stands and yields varied in the different trials so that no one treatment was consistently outstanding. Seed treatments were effective in preventing seed rotting but did not protect plants from later attacks by root-rotting organisms. Isolations from diseased plants showed that *Fusarium solani martii* f. 2, *Ascochyta pinodella, Pythium* sp., and *Corticium vagum solani* were present in Colorado soils.

Early harvesting of healthy seed potatoes for the control of potato diseases in Maine, E. S. SCHULTZ, R. BONDE, and W. P. RALEIGH. (Coop. U. S. D. A.). (*Maine Sta. Bul. 427 (1944), pp. 19+*).—When tubers were harvested from tuber-unit seed plots on successive dates the extent of spread of virus diseases increased with time, there being little disease in stock harvested during July 25 through the first week of August but usually a considerable amount in that lifted late in the season. Tubers harvested by the first week of August were relatively free from leaf roll, mosaic, and spindle tuber; when aphids were few or absent, very little infection was found in those harvested the second week of August or even later. This early-harvest seed-plot method has been successfully employed with eight experimental seed plots located in different parts of Aroostook County, and a number of farmers have maintained high-quality seed potatoes by its use over 10–20-yr. periods. When late blight is present, seed plots should not be harvested while the foliage is green. Hand pulling is an effective though expensive method of killing the tops for the early-harvest seed plot; in the work here described the tops were killed by spraying with a solution of Sinox (2 gal.) and $(NH_4)_2SO_4$ (10 lb.) in 100 gal. water. Treating freshly dug tubers with a formaldehyde solution (1 pt. to 30 gal. water) or a weak bordeaux (3–3–100) greatly reduced the amount of late blight rot. If all growers in potato regions would practice the method here described, it is believed that ring rot would be eliminated and virus diseases controlled to such an extent that epidemics would be very much reduced, if not prevented.

Relation of heat and desiccation to bacterial soft rot of potatoes, D. H. ROSE and H. A. SCHOMER. (U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 6, pp. 149–161, illus. 2*).—There is good evidence that bacterial soft rot—frequently referred to as "sunscald"—in early and intermediate crop potatoes shipped directly from the field is due chiefly to one condition or set of conditions; this paper considers primarily the relation of the rot to these conditions. From controlled experiments with infrared lamps—described in detail—it appeared that there was an accumulation of heat in the tubers after a prolonged exposure to these rays, and that the resultant flesh temperature was far above that of the surrounding air; i. e., heat injury can be produced in potatoes even when air temperatures are not excessively high. The symptoms developing resembled very closely those seen many times in the field on tubers harvested in warm or very hot weather. In potatoes harvested at weekly intervals over a 5-week period, all exposed so that tissue temperatures reached 135°–140° F. showed the typical symptoms of heat injury. When tubers with skinned areas were exposed to the infrared rays the air and tissue temperatures at the skinned places were lower than those where the skin was intact, probably because some of the heat was absorbed by evaporation from the freshly exposed surface. When evaporation continued for 2–3 hr. or more, it caused a marked pitting or sinking of the flesh. Further experiments indicated that the heat injury and the bacterial soft rot are two different phenomena and that the rot follows the injury only when the bacteria are present and conditions favor their development. It is evident that whether or not the bacterial soft rot develops on tubers in transit is largely a matter of transit temperatures, provided that prior to shipment the tubers have been subjected to the conditions predisposing them to the rot. Under field conditions, the soft rot bacteria are almost certain to be present. It is believed that much of the commercial loss encountered has been due to unavoidable exposure of the tubers to heat of the sun when help could not be obtained to get them picked up and hauled from the field promptly after they were dug. From further tests it seems evident that the reason why skinned potatoes blown for 12 hr. in moist air do not shrivel when later held in dry air is that they have begun to suberize; it is not clear, however, why in either still or moving moist air they brown very little if at all, whereas in dry air they develop browning within a half hour. The controlled tests and field observations show that the need of picking up potatoes promptly after digging applies equally well in preventing both heat injury and skin browning.

Observations on phloem necrosis of potato tubers, G. B. SANFORD and J. G. GRIMBLE (*Canad. Jour. Res., 22 (1944), No. 4, Sect. C, pp. 162–170, illus. 1*).—In field tests of random lots of tubers showing phloem necrosis of similar type, the vines from five developed typical leaf roll symptoms, but those from three others exhibited no sign of this or other symptoms suggesting a virus etiology. The net necrosis in one of the latter samples was known to have resulted from vine infestation by the potato psyllid; in this case the stock returned to full vigor during the second season. It was further confirmed that once the vines show definite symptoms of leaf roll, the phloem elements of their tubers henceforth do not exhibit necrosis; tuber net necrosis as associated with the leaf roll virus is thus considered a transitory symptom of primary infection. Tissues contiguous to the necrotic phloem elements in affected tubers were uniformly fluorescent, but the unaffected portion of such tubers as well as the nonnecrotic tubers from positive leaf roll plants reacted negatively to ultraviolet light.

Variation and physiologic specialization in the common scab fungus (Actinomyces scabies), L. A. SCHAAL. (U. S. D. A. et al.). (*Jour. Agr. Res.* [*U. S.*], *69 (1944), No. 5, pp. 169–186, illus. 11*).—Single-cell cultures of *A. scabies* obtained from potatoes grown on various soil types in different States differed in color of mycelium and pigment produced on modified potato-dextrose agar. The isolates were unstable and produced variants often differing culturally from both the parents and each other; one variant did not sector during a 3-mo. period. No isolate produced cells averaging more than 2.5μ long; some produced spirals, and others did not. Aerial mycelium was inhibited by high-N media. Most rapid growth was made on a medium containing thiamine; here the number of sectors was greater. On potato-dextrose agar four isolates grew somewhat better at 20°–24° than at 18° C. Sectors were produced at all temperatures studied, but were smaller at 18° than at 22° and 24°. Ten isolates grew on potato-dextrose agar adjusted to pH 5–8.5, but after 60 days five of them had made very little growth at pH 5; sectors were produced at all pH values except 5. A number of isolates tested on three commercial and five seedling potato varieties differed in pathogenicity. No definite correlation was detected between pathogenicity and cultural or other characteristics. Variants seemed to differ from their parent cultures in pathogenicity. Certain strains produced russeting of normally smooth-skinned varieties.

A Thecaphora smut on potatoes, M. F. Barrus. (Cornell Univ.). (*Phytopathology, 34* (*1944*), *No. 8, pp. 712–714, illus. 2*).—The cause of the buba disease of potatoes in Venezuela (E. S. R., 90, p. 351) is here described as *T. solani* n. sp.

Rice yields in root rot areas improved by application of fertilizer, S. J. P. Chilton, W. A. Douglas, and T. C. Ryker. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 379* (*1944*), *pp. 8, illus. 1*).—In the rice district of southwestern Louisiana there are numerous areas where rice fails to grow satisfactorily; these are usually poorly drained and known locally as "root rot areas" or "alkali spots." In 5 years' experiments with a 10–10–0 fertilizer applied at the rate of 400 lb. per acre on such areas the material was made up by applying equal amounts each of 20 percent ammonium sulfate and acid phosphate. Little increase in yields followed where the land had not also been drained; with drainage and fertilizer, an average increase of 3.6 barrels of rice per acre was obtained.

A necrose da base da fôlha do sisal [Necrosis of the leaf base in sisal], J. C. Medina (*Bragantia, 3* (*1943*), *No. 4, pp. 73–84, illus. 4; Eng. abs., p. 81*).—*Agave sisalana* growing in various localities of the State of São Paulo is often seriously damaged by this trouble, the symptoms of which resemble the "leaf foot disease" previously reported from Java and Africa. In a fertilizer experiment described, the disease was controlled by application of K_2SO_4. It is said to be the only prevalent and destructive disease of sisal hitherto reported in this State, where this fiber plant is usually cultivated on K-deficient soils.

Additional strains of the sugar-beet curly top virus, N. J. Giddings. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 4, pp. 149–157, illus. 4*).—The author differentiates 6 strains of curly top virus (*Ruga verrucosans*) from each other and from the 4 previously described strains (E. S. R., 79, p. 639). Turkish tobacco, Red Mexican bean, and a susceptible and a resistant variety of sugar beet were employed as hosts in preparing data for a key to differentiate the 10 strains; a list is also given of the plants tested for possible value as differential hosts. Inoculation of beans through the cotyledons proved more effective than through the leaves. Some virus strains induced extreme dwarfing and high mortality without the pronounced distortion hitherto thought characteristic of severe curly top injury. Since efforts to induce changes in virulence were unsuccessful, these virus strains are believed to be very stable. Their relative virulence is compared for each of the four hosts used in formulating the key table.

Contestando algunas preguntas sobre el "carbon" de la caña [Answering some questions concerning sugarcane smut (Ustilago scitaminea)], W. E. Cross (*Estac. Expt. Agr. Tucumán Cir. 121* (*1943*), *pp. 4*).

The occurrence of a variant in Rhizoctonia solani, L. H. Person. (La. Expt. Sta.). (*Phytopathology, 34* (*1944*), *No. 8, pp. 715–717, illus. 1*).—A sector variant occurring in an isolate from snap bean is described as differing in growth rate at certain temperatures and as less pathogenic than the original culture on beans, soybeans, cowpeas, and English peas.

Little disease found in California cabbage seed, W. C. SNYDER and K. F. BAKER. (Univ. Calif.). (*Seed World, 55 (1944), No. 9, pp. 41–42*).—A brief note on a survey of the seed crop in 1943.

Shanking: A new disease of onion and shallot, C. J. HICKMAN (*Gard. Chron., 3. ser., 114 (1943), No. 2964, pp. 140, 141, illus. 1*).—A preliminary report on a disease of onion and shallot resembling the shanking disease of tulip due to *Phytophthora.* The mycelium of a species of *Phytophthora* was observed in the rotted tissues of every affected specimen thus far examined.

Bacterial soft rot of spinach, M. A. SMITH. (U. S. D. A. et al.). (*Phytopathology, 34 (1944), No. 8, pp. 747–752, illus. 1*).—Morphological studies as well as cultural and biochemical tests indicated the isolates from harvested spinach soft rot and *Erwinia carotovora* to be closely related if not identical. Differences in carbon metabolism are not considered sufficient to differentiate them. Pathogenicity tests showed that infection of spinach may take place through injured or uninjured leaves. Isolates from rotted spinach proved pathogenic to potato tubers. Spinach soft rot may be controlled in transportation and marketing if a temperature of 4.5° C. is maintained for 8 days.

Tomato diseases, G. H. BERKELEY and J. K. RICHARDSON (*Canada Dept. Agr. Pub. 759 (1944), pp. 18, illus. 22*).—An informatory contribution on fungus, bacterial, virus, nematode, and physiological diseases and their control.

Basal rot of tomato, J. K. RICHARDSON and G. H. BERKELEY (*Phytopathology, 34 (1944), No. 7, pp. 615–621, illus. 2*).—This hitherto unreported basal rot of greenhouse tomato—proved to be caused by an unidentified fungus—was found near London, Ont. The symptoms, consisting of defoliation of the lower leaves and a cortical rot of stalk and roots, and a description of the pathogen are given in detail. The disease, which may reduce yields as much as 50 percent, can be controlled by soil sterilization with steam, chloropicrin, or formalin.

The liberation of virus, together with materials that inhibit its precipitation with antiserum, from the solid leaf residues of tomato plants suffering from bushy stunt, F. C. BAWDEN and N. W. PIRIE (*Brit. Jour. Expt. Pathol., 25 (1944), No. 2, pp. 68–80*).—After the sap had been expressed from minced tomato leaves infected with tomato bushy stunt virus, the solid residues contained approximately as much virus as the sap. This virus was most effectively liberated by incubating residues with a commercial trypsin preparation and then passing them through a roller mill; some virus was liberated by either treatment alone. Incubation with "trypsin" greatly increased the amount of virus liberated by milling, whereas extended milling reduced the amount liberated by trypsin. Purified preparations of virus from sap and solid residues had similar properties. Extracts of milled fiber contained some virus combined with chromoprotein to form a nonprecipitating antigen; such extracts did not precipitate with virus antiserum until the chromoprotein had been removed. Nonprecipitating complexes of virus and chromoprotein can be formed by milling fiber of uninfected plants to which purified virus is added. Extracts of fiber from healthy and infected leaves which have been incubated with trypsin contain material inhibiting the precipitation of bushy stunt virus by its antiserum.

The unimportance of tomato seed in the dissemination of Verticillium wilt in California, B. A. RUDOLPH. (Calif. Expt. Sta.). (*Phytopathology, 34 (1944), No. 7, pp. 622–630*).—In experiments during five seasons over a 10-yr. period, the receptacles of 2,792 tomatoes produced on 164 severely diseased plants were cultured but only 180 were found to be infected by *V. albotrum.* More than 26,768 seeds taken directly from these 180 tomatoes were cultured; only 2 yielded the fungus. The total seed cultured represented a relatively small number of the total seed produced by these same plants, since most of the fruits were borne on receptacles which did not yield *Verticillium* in culture and, presumably, must have been healthy. The experiments revealed no significant relation between the discoloration of the vascular system in either the receptacle or the core; both may be discolored in the same fruit or possibly the receptacle may show discoloration and the core none, and vice versa. The great bulk of seed produced by diseased plants germinated readily and produced healthy plants in the culture plates. The fact that two seeds yielded *Verticillium* in culture did not necessarily prove them to be infected, since in each instance the fungus may have been confined to the funiculus; if so, the ordinary fermentation process of preparing tomato seed for the trade would rid the seed of the gelatinous envelope, the funiculus, and the fungus contained in it. Neither of the two seeds germinated, which might indicate that they had been parasitized and killed; if so, they could have constituted no factor in dissemination of the disease when planted. Assuming the seed to have been parasitized but not killed, there is no assurance that the fungus would live over winter and attack the young seedlings. That the seed can transmit the disease is considered highly improbable and certainly of no economic importance; other means of dissemination are discussed.

Observations sur quelques maladies non parasitaires des arbres dans le Québec [Observations on some nonparasitic diseases of trees in Quebec], R. POMERLEAU (*Canad. Jour. Res., 22 (1944), No. 4, Sect. C, pp. 171–189, illus. 20*).—The author summarizes his observations on such tree diseases as they occur in the Province of Quebec, including the effects of winter injury and late spring frosts, exposure to the sun, excessive heat and dryness, and of noxious gases and dusts—especially in mining regions. There are 27 references.

Improved cork-borer method for inoculating trees, R. B. CLAPPER. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 8, pp. 761–762, illus. 1*).—Instructions are given for modifying a cork borer to reduce the number of movements for inoculating trees by this method. The modification contains a plunger and spring actuated by the thumb to eject the plugs.

Ripe-spot of apples (Neofabraea malicorticis), G. G. TAYLOR and R. M. BRIEN (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 2, Sect. A, pp. 63–72, illus. 9*).—This disease is reported to have become increasingly serious during recent years in New Zealand; its symptoms, incidence, economic importance, and the factors influencing its development, as well as the morphology of the causal fungus, are considered. Comparative symptoms of ripe rot and similar types of apple rots occurring in that country are presented in tabular form, with additional notes for assistance in diagnosis.

A method of inoculating peach seedlings with crown gall without using punctures, C. O. SMITH. (Calif. Citrus Expt. Sta.). (*Phytopathology, 34 (1944), No. 8, pp. 764–765*).—Crown galls usually arise through injuries into which the causal bacteria are introduced or by growing the plants in infected soil. Another method proving equally satisfactory for infecting peach seedlings was to use a suspension secured from soaking uninjured crown galls in water overnight. In each of a number of 5-gal. containers filled with dark-colored mountain soil (pH 8.36), 25 germinating peach pits were planted. On emergence of the seedlings some of the containers were watered, each with 1 qt. of a suspension obtained from soaking 20 large crown galls in 20 qt. of water overnight. After a season's growth 53 percent of the 329 trees treated with the suspension had developed galls, as against 9.6 percent of the 93 untreated trees.

Lime in the post-arsenical sprays as a means of reducing arsenical injury to peaches, R. H. Daines. (N. J. Expt. Stas.). (*Phytopathology, 34 (1944), No. 8, pp. 763–764*).—The three tests reported show that inclusion of hydrated lime in a spray which follows one containing lead arsenate by approximately 2 weeks may materially reduce the amount of foliage injury to peaches resulting from the use of lead arsenate.

The first test of Fermate, a new fungicide, on cranberries, R. B. Wilcox. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 74 (1944), pp. 18–23*).—In the 1943 field test reported, the bordeaux plats had about 35 percent less field rot than the untreated controls; the Fermate plats, 94 percent less. Furthermore, there were apparently no ill effects of the latter on the plants, which were in better condition at the end of the season than those receiving bordeaux, and the fruit was definitely larger and without spray residue at harvest.

Avocado tree decline, A. S. DeBard (*Calavo News, 17 (1943), No. 2, pp. 3, 7; also Calif. Avocado Soc. Yearbook, 1943, pp. 39–40*).—The author believes avocado tree decline to result largely from improper soil management and briefly outlines what he considers a proper procedure of handling the trees.

Wilt of cacao fruits (Theobroma cacao).—III, Changes in mineral content during development, E. C. Humphries (*Ann. Bot. [London], n. ser., 8 (1944), No. 29, pp. 57–70, illus. 5*).—The results of this phase of the study (E. S. R., 89, p. 460) indicated a large increase in P content of the pulp during preripening and ripening of the fruit, and there appears to be an actual loss of P from the wall during the latter stage. The relative (logarithmic) rates of uptake of N, P, K, and Ca by the wall were constant and equal during the period from 25 to 57 days; this rate was also equal to that for the dry matter increase over the same period. After 57 days the rates became less but were maintained up to 107 days. In this second stage the relative rates of uptake of the individual elements were no longer equal to one another, K alone maintaining a rate equal to that of the dry matter increase. Mg appeared to behave somewhat differently from the other elements. The relative rates of uptake of N, P, K, and Ca in the pulp were equal to one another and to the relative rates of uptake in the wall during the first stage, but these rates were maintained in the pulp up to 107 days. In the form of their oxides, K, Ca, Mg, and P constituted over 90 percent of the total ash of the kernel of a ripe cacao bean. By assuming that Ca does not move in the phloem and that the relative proportions of the mineral elements in the transpiration stream are constant, it is concluded that during the first 75 days of fruit development mineral substances are imported mainly via the xylem. Hence during this period the young fruit would tend to be sensitive to water strain or competition in such substances, either condition being likely to cause wilting. Previous evidence had indicated a period of 75 days as a critical stage in the development of the fruit. It is suggested that the long critical period of the cacao fruit is due to the late development of the fertilized ovum.

Progress report on "decline" of citrus, L. J. Klotz and H. S. Fawcett. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 10, pp. 294–295*).

Web blight of seedling tung trees tentatively identified as the Rhizoctonia stage of Corticium microsclerotia, J. R. Large. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 7, pp. 648–649, illus. 1*).—Leaves of tung trees with web blight symptoms are reported from Mississippi and Louisiana. The size of the sclerotia formed, growth of the fungus in water-agar cultures, and the general similarity of the symptoms on diseased tung trees to those described for web blight of beans suggested that it is the *Rhizoctonia* stage of *C. microsclerotia.*

Chalara quercina n. sp., the cause of oak wilt, B. W. Henry. (Wis. Expt. Sta.). (*Phytopathology, 34 (1944), No. 7, pp. 631–635, illus. 1*).—The causal fungus of the wilt attacking *Quercus alba, Q. borealis, Q. coccinea, Q. macrocarpa,* and *Q. velutina* in Illinois, Iowa, Minnesota, and Wisconsin is described as *C. quercina* (see following entry).

Oak wilt: Its significance, symptoms, and cause, B. W. Henry, C. S. Moses, C. A. Richards, and A. J. Riker. (Wis. Expt. Sta. coop. U. S. D. A.). (*Phytopathology, 34 (1944), No. 7, pp. 636–647, illus. 2*).—This destructive oak disease—studied in Wisconsin and neighboring States—has appeared widely distributed and its presence has been confirmed by positive culture work in 23 counties of Wisconsin, 5 of Minnesota, 2 of Iowa, and 1 of Illinois; it appears to be the most important oak disease in the Upper Mississippi Valley. No correlation was found between site and occurrence. Red and black oaks were the most common hosts and, once attacked, have not been known to recover. Two wilting scarlet oaks were found; white and bur oaks were also attacked but seemed relatively tolerant.

The first symptoms are slight crinkling and paling of the leaves, often followed by a progressive bronzing to browning of the leaf blade from the lateral edges and apex toward the midrib and base; mature leaves remain relatively stiff, but young leaves droop conspicuously. Defoliation varies in extent and seemingly occurs at any symptom stage on mature leaves. Affected young leaves remained attached after wilting. Symptoms usually progress over the entire tree within a few weeks. Secondary foliage often appears along the trunk and larger branches, but this in turn wilts and dies. Discoloration in the sapwood of twigs was found in numerous cases but is not diagnostic. A fungus, tentatively placed in the genus *Chalara,* was isolated from 116 of 122 wilt trees sampled but was not obtained from any of 56 nonwilt trees. Stem inoculations and reisolations were successful on 74 of 90 woodland trees, cultures from 8 locations in Wisconsin being used.

Measuring the local distribution of Ribes, S. B. Fracker and H. A. Brischle. (U. S. D. A.). (*Ecology, 25 (1944), No. 3, pp. 283–303, illus. 9*).—Observations on the local distribution of *Ribes* in three locations of northern Idaho and eastern Washington and in two of California are reported. The *Ribes* in four of the locations were distributed locally as if a "contagious" distribution were superimposed on a random "Poisson" distribution in the proportion of about 2 to 1; in one of the California plats the proportion was about 3 to 2. This plan of distribution is consistent with the biology of *Ribes,* and the authors propose the term "mixed" distribution to describe it. If s represents the size of each block in acres, c the percentage of check (in this case either 4 or 8), and r the *Ribes* per acre, the product of the three, scr, represents the *Ribes* population per 100 quadrats. The fact that any given value of the products $s \times c \times r$ shows substantially the same percentage, i, of occupied quadrats, regardless of the percentage of check or the size of quadrat, is of practical significance to the problem of checking the blister rust-control projects. It indicates that increasing the percentage of check renders possible a proportionate decrease in either the unit size of the plat or the minimum *Ribes*-population class about which information is desired.

Divergence from the random type of divergence can be measured by a distribution factor, D, since such a divergence tends to follow the relationship $scr = Dn$, where n is the mean number of *Ribes* per 100 quadrats that would be expected in the case of a strictly random distribution in which the observed percentage, i, of the quadrats were occupied. A Poisson transformation can be used to bring the data into this rectilinear form for analysis of variance. Where curvilinearity is apparent, divergence can be measured by the d factor in the equation $scr = n + dn^2$.

Whatever method of measurement is used, divergence from randomness tends to decrease somewhat as a plat is subdivided into smaller and more numerous quadrats, but the decrease in the *d* factor is not uniform or progressive and is not sufficiently large to reduce the value of the factor as a measure of the overdispersion. The relative variance also provides one of the convenient and practicable measures of divergence from randomness; it has the disadvantage in some cases of increasing with the size of the plat and of the mean. When the probit-logarithmic transformation is used, the *Ribes* data here presented take a straight-line form, providing another manner in which the field records can be subjected to analysis of variance. The coefficients in this transformation do not, however, provide a convenient measure of divergence from the random distribution. This transformation is not so well adapted to areas where the distribution is very close to the strictly random type. There are 23 references.

Studies on Polystictus circinatus and its relation to butt-rot of spruce, R. Gosselin (*Farlowia, 1 (1944), No. 4, pp. 525–568, illus. 13*).—This disease was studied on account of its importance in the Province of Quebec, as well as because of its peculiar behavior. White pocket butt rot was localized in such a definite way as to suggest relationships with conditions of temperature, insect epidemics, mechanical damage, or with the chemical nature of the soil; none of these factors, however, appeared responsible for the disease. On the other hand, field observations gave evidence that the causal agent penetrated into its host by mycorhizal association. Results of further study led the author to believe that the fungus has actually formed a mycorhizal association of the usual type. If *P. circinatus* penetrates into its host through a symbiotic association—and there is presumptive evidence that such is the case—this fact will open an entire new field in forest pathology, associating the two opposing concepts of symbiotism and parasitism. If these findings prove generally true, foresters will no longer be able to consider the butt rots merely as a reducing factor for the volume of the tree, but must determine under what conditions the damage from parasitism exceeds the beneficial effects of symbiotism in trees.

Is natural gas injurious to flowering plants? F. G. Gustafson (*Plant Physiol., 19 (1944), No. 3, pp. 551–558, illus. 2*).—On the basis of experimental data presented, it is concluded that natural gas in air is not injurious to yellow green coleus, sunflower, snapdragon, stock, or tulip plants at a concentration of 1 percent; higher concentrations were not used. Tomato, cyclamen, marigold, sensitive plants, carnations, and *Kalanchoe tubiflora* were not injured by 2 percent; again, higher concentrations were not used. Bougainvillea and swainsonia were injured by 2 but not by 1 percent. Seeds of lupine, radish, wheat, squash, and sunflower germinated as well in 1.5–5 percent natural gas as in air.

Dipping rooted chrysanthemum cuttings in Fermate for Septoria leafspot control, A. W. Dimock and H. Allyn. (Cornell Univ. et al.). (*Chrysanthemum Soc. Amer. Bul., 12 (1944), No. 2, pp. 9–11*).—Good results are reported from trials of this method during the past season.

Fermate treated cuttings reduces basal rot and stimulates rooting, C. M. Tompkins. (Univ. Calif.). (*Chrysanthemum Soc. Amer. Bul., 12 (1944), No. 2, pp. 3–4*).—In the tests reported Fermate proved excellent as a protective dust against a basal rot of soft green cuttings of the pompon and large-flowering varieties of the florists' chrysanthemum.

Studies on lily virus diseases: The mottle group, P. Brierley and F. F. Smith. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 8, pp. 718–746, illus. 11*).—Three mottle viruses from lilies, a latent type from *Lilium tigrinum* (LT), the strong mottle of Easter lily (CM), and a more virulent mutant from the latter (VCM), were compared with McWhorter's tulip viruses 1 and 2 in the test species

Easter lily, *L. formosanum, L. tigrinum,* and tulip. The host range of CM was found limited to Liliaceae; the known ranges of the other four viruses were similar except that the VCM strain infects also *Ornithogalum thyrsoides.* The properties of the five viruses were determined as to inactivation by heat, dilution, aging, and drying. CM was transmitted by *Aphis gossypii, Macrosiphum solanifolii,* and *Myzus persicae,* but not by the common lily-infesting species *M. circumflexus, M. convolvuli,* or *Macrosiphum lilii. Myzus persicae* carried all five viruses with high efficiency. *A. fabae* and *A. gossypii,* in addition to the previously established vectors *Macrosiphum solani folii* and *Myzus persicae,* transmitted virus from Rembrandt tulips to *L. formosanum.* CM, naturally or experimentally established in Easter lilies, offered complete protection against further addition of CM or VCM. The tulip viruses TV1 and TV2, and LT from *L. tigrinum,* similarly established in Easter lily, offered no protection against VCM. LT in *L. tigrinum* failed to protect this species against CM, which produces killing effects in this host species. Over 12,000 seedling Easter lilies grown from seed of diseased parents showed no evidence of seed carriage of any lily virus. It is suggested that the five viruses studied be considered strains or subspecies of tulip-breaking virus, which *Marmor tulipae* may be amended to describe, and which will correspond to Tulipa virus 1 if the alleged hosts *Hyacinthus* and *Narcissus* are omitted. VCM is considered a mutant from CM that appears in Easter lily stocks carrying CM. Easter lily producers, already ignoring CM because it is impracticable to rogue in this species, are advised to ignore VCM also for the same reason, although the latter produces some cull plants.

Black-spot resistance in roses, H. R. Rosen. (Ark. Expt. Sta.). (*South. Florist and Nurseryman, 57 (1944), No. 6, pp. 5, 14*).—The author briefly summarizes his findings to date in the search for black spot resistance in roses.

Control of black spot of roses with sulphur-copper dust, E. W. Lyle (*Texas Sta. Bul. 648 (1944), pp. 27, illus. 7*).—The sulfur-copper dust developed and field-tested by the station gave better control of *Diplocarpon rosae* than the pure dusting sulfur formerly recommended. Among the most effective mixtures were those containing about 90 percent 325-mesh dusting S and 10 percent of such insoluble Cu fungicides as "34" Copper Fungicide, Copper Hydro 40, Cuprocide, Dow copper, Grasselli copper, SprayCop, Copper Oxychloride Sulphate, and Cupro-K. Addition of various stickers failed to improve the control materially. In greenhouse tests the dust was removed by brief sprinkling; best results in the field were obtained when the fungicide was applied within 24 hr. after each rain. The best schedule appeared to be once each week after appearance of black spot until July 1, and then within 24 hr. after each rain—but not oftener than once a week. Use of resistant or immune understock varieties delayed infection on the scions. Any delay in the occurrence of black spot in a field lessened the amount of fungicidal treatment required—e. g., late cutting off of the understock tops and pruning back to less than 0.5 in. all prematurely formed scions. Results from dusting were about the same whether directed downward or upward onto the foliage. Most satisfactory control was obtained with use of about 20–25 lb. per acre at each application by rotary hand duster or 15–20 lb. by tractor power duster. Benefits from this dust on field roses were also obtained in storage.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Transactions of the Eighth North American Wildlife Conference (*Washington, D. C.: Amer. Wildlife Inst., 1943, pp. 423+, illus. 9*).—These transactions comprise numerous papers by various authors covering general topics, wartime utilization of wildlife crops, looking ahead in conservation, methods of handling big-game and small-game crops during wartime, pond and small lake management, education, economic utilization of rough fish, fur resources, mistakes made in wildlife management, and recent developments in wildlife technics. The following are from State experiment station or land-grant college sources: Summary and Recommendations From the Technical Sessions, by T. I. Storer (pp. 79–86) (Univ. Calif.); Effect of Management Practices on the Catch in a 12-Acre Pond During a 10-Year Period, by H. S. Swingle and E. V. Smith (pp. 141–151), and Results of Further Experiments on the Stocking of Fish Ponds, by E. V. Smith and H. S. Swingle (pp. 168–173) (both Ala. Expt. Sta.); Wildlife—An Essential Resource, by P. F. English (pp. 187–190) (Pa. State Col.); Class Field Trips in Wildlife Management, by L. Wing (pp. 195–197) (Wash. State Col.); A Wildlife Conservation Teaching Program, by W. B. Davis (pp. 198–205) (Tex. A. and M. Col.); and Teaching Outdoor Wildlife Techniques, by G. H. Kelker (pp. 206–209) (Utah Sta.).

Highway mortality of wildlife in southern Michigan, A. O. HAUGEN (*Jour. Mammal., 25 (1944), No. 2, pp. 177–184*).—The greatest highway mortality of cottontails, fox squirrels, muskrats, opossums, skunks, and raccoons was found associated with the increased activity during the breeding season and periods of dispersal. The definite early spring increase for cottontails results largely from an increase in the kill of males. The ultimate effect of highway mortality of small game in this area—especially cottontails—is believed insignificant in consideration of the total population susceptible to hazards of highway traffic.

A deer browse survey method, S. E. ALDOUS (*Jour. Mammal., 25 (1944), No. 2, pp. 130–136*).—This report describes a simplified technic for making browse surveys.

Notes on mountain goats in the Black Hills, W. H. HARMON. (U. S. D. A.). (*Jour. Mammal., 25 (1944), No. 2, pp. 149–151*).—Field notes on *Oreamos americanus* and subspecies.

Helminth parasites of the gray fox, H. K. BUECHNER (*Jour. Mammal., 25 (1944), No. 2, pp. 185–188*).—Examination of 80 preserved viscera and 52 additional stomachs of the gray fox revealed 10 kinds of helminth parasites, 5 of which—*Taenia pisiformis, Ancylostama canium, A. braziliense, Physaloptera rara,* and *Pachysentis canicola*—appear to be pathologically important. No parasites were found in any of the internal organs other than the stomach, intestines, and trachea. The occurrence of *P. canicola* (Acanthocephala) in North America is here reported for the first time.

Algunos roedores de importancia agricola—generalidades [Some rodents of agricultural importance], A. PENICHE CANTO (*Fitófilo, 2 (1943), No. 4, pp. 59–81*).

Some rodent populations in the Sierra Nevada of California, T. I. STORER, F. C. EVANS, and F. G. PALMER. (Univ. Calif.). (*Ecol. Monog., 14 (1944), No. 2, pp. 165–192, illus. 18*).—Despite the important relations of rodents to agriculture, public health, wildlife conservation, recreation, and other fields of man's interests, it is stated that surprisingly little direct research on the native species has been carried out. This study has to do with the rodents of the Lake Tahoe and Bass Lake areas, including such matters as their ecology, population changes, and control. Detailed accounts are presented of 13 species.

A new race of the canyon mouse, O. B. GOIN. (Univ. Fla.). (*Jour. Mammal., 25 (1944), No. 2, pp. 189–191, illus. 1*).—*Peromyscus crinitus doutti* n. subsp. is described.

Growth and reproduction of the cotton rat (Sigmodon hispidus hispidus) under laboratory conditions, B. J. and R. K. MEYER. (Univ. Wis.). (*Jour. Mammal., 25 (1944), No. 2, pp. 107–129, illus. 12*).—A review of the literature

(18 references) concerned with the natural history of the cotton rat is presented—taxonomy, habitat, breeding and food habits, economic importance, predators, and cycles of abundance. An account is also given of the equipment and methods used in establishing and managing a laboratory colony of this rodent.

The breeding season in two species of Dipodomys, K. L. DUKE (*Jour. Mammal., 25 (1944), No. 2, pp. 155–160, illus. 2*).—The two kangaroo rats *D. ordii columbianus* and *D. microps bonnevillei* from central Utah were found to have two breeding seasons a year and two periods of anestrus. The first breeding season is from January to (possibly through) March, followed by the first anestrous period from late June to late August. The second breeding season is from early September through October, followed by a second anestrus period postulated from late October or early November until late December or early January.

Um foco potencial de Tripanosomíase Americana na Cidade do Rio de Janeiro (Distrito Federal) [A potential focus of American trypanosomiasis in Rio de Janeiro], F. N. GUIMARÃES and G. JANSEN (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 405–417, illus. 23; Eng. abs., p. 417*).—Fifteen specimens of opossum (*Didelphis marsupialis*) in the residential zone of the city were found spontaneously infested with *Schizotrypanum cruzi*. Another marsupial, *Metachirus nudicaudatus*, is reported for the first time as a wild host of these trypanosomes. Of 11 specimens of the reduviid bug *Panstrongylus megistus* captured in a large building in the same locality, 9 were infested.

Observations on the eastern porcupine, J. D. CURTIS and E. L. KOZICKY. (Univ. Maine et al.). (*Jour. Mammal., 25 (1944), No. 2, pp. 137–146, illus. 1*).—This study concerns the distribution of *Erethizon dorsatum dorsatum* in New England, its feeding and other habits, movements, senses, physique, parasites and enemies, interrelationships with other animals, and economic status. Methods of trapping and handling are also discussed.

The molting of the wandering shrew, W. W. DALQUEST. (Univ. Calif.). (*Jour. Mammal., 25 (1944), No. 2, pp. 146–148, illus. 1*).—On *Sorex vagrans*, a species of long-tailed shrew common in the western United States and especially abundant in the western part of Washington.

Leaf nests of gray squirrel in Connecticut, W. D. FITZWATER, JR., and W. J. FRANK (*Jour. Mammal., 25 (1944), No. 2, pp. 160–170, illus. 1*).—An intensive study was made of 146 leaf nests of the gray squirrel on the Litchfield-Morris Wildlife Sanctuary. The construction of leaf nests is important in the life history of the squirrel, since it provides an adequate number of shelters and clean quarters located near a source of food. Details as to location and construction of the nests are given. Besides several centipedes and free-living nematodes, 18 species of insects were found in the nests.

Nineteenth supplement to the American Ornithologists' Union Check-List of North American Birds, A. WETMORE ET AL. (*Auk, 61 (1944), No 3, pp. 441–464*).

A two-year bird census on San Juan Island, Washington, M. R. MILLER. (Univ. Calif.). (*Auk, 61 (1944), No. 3, pp. 395–400, illus. 1*).

Birds of the Katmai region, Alaska, V. H. CAHALANE (*Auk, 61 (1944), No. 3, pp. 351–375*).—In this trip through Katmai National Monument of the Alaska Peninsula the opportunities for observing bird life were limited to those afforded by official travel; although it was not possible to make collections of specimens, the sight records and other observations seemed worth recording. Prior to consideration of the species of birds seen, accounts are given of the region covered, the life zones and associations, the itinerary taken, and previous work.

Cross-mating of Canada geese with Emden geese, A. W. BLAIN (*Auk, 61 (1944), No. 3, pp. 389–391, illus. 1*).

Brood habits and growth of "blue grouse," L. WING, J. BEER, and W. TIDYMAN. (Wash. State Col. et al.). (*Auk, 61 (1944), No. 3, pp. 426–440, illus. 1*).—On *Dendragapus fuliginosus* and *D. obscurus*, "the West's premier game birds," which inhabit mountain forests from Alaska to New Mexico. The principal work in this study was concentrated in the general area accessible from Conconully, Okanogan County, Wash., on the east side of the Cascades, summer of 1940.

Preliminary notes on the development of nestling pileated woodpeckers, J. S. Y. HOYT. (Cornell Univ.). (*Auk, 61 (1944), No. 3, pp. 376–384, illus. 2*).—The work here reported upon was done on *Ceophloeus pileatus abieticola* nesting in the vicinity of Ithaca, N. Y.

Food crops for game birds on farm lands, A. M. PEARSON and D. G. STURKIE (*Alabama Sta. Cir. 90 (1944), pp. 20, illus. 28*).—Much of the food needed by game birds in Alabama can be provided by diversified farming; the principal need for special wildlife plantings on farm lands is to alleviate the food shortage usually most severe during March-April. Such plantings are compatible with good farm management and for the most part should be located along field borders and fence rows. Detailed information as to where, when, how, and what to plant is presented.

Germination of seeds after ingestion by ring-necked pheasants, W. G. SWANK (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 223–231, illus. 4*).—In the investigation reported, the percentage of seeds escaping digestion varied among different species; those with hard seed coats were most frequently passed uninjured. Other things being equal, smaller seeds were passed in greater numbers than large seeds. Seeds that had passed through the digestive tract of the pheasant germinated more quickly than those not so exposed. Soft-coated seeds (e. g., alfalfa, nightshade, millet, flax) were almost all digested, but some passed uninjured and viable. Wild grape, which has a very hard seed coat, showed the greatest resistance to breakage in the digestive tract, but over 75 percent of its seeds were digested. A large proportion of rose seeds were broken and digested; utilization was sometimes over 95 percent of those eaten. It is recommended that seeds for food plat mixtures include some easily digested and others that are resistant. On management projects, advantage may be taken of the capacity of pheasants to disseminate seeds of food plants in the places they frequent, thus reducing the amount of artificial propagation required to establish adequate food and cover.

Occurrence and distribution of the trematode Collyriclum faba (Bremser) in birds, D. S. FARNER and B. B. MORGAN. (Univ. Wis.). (*Auk, 61 (1944), No. 3, pp. 421–426*).—This trematode parasite has been reported from 2 orders, 13 families, 24 genera, and 26 species of birds. The purpose of this paper is to record a new host (cowbird), give a brief review of the literature (30 references), and present a parasite-host list with its geographical distribution, believed to be complete.

Notes on the pupal development of Stilbometopa impressa (Diptera: Hippoboscidae), C. M. HERMAN (*Jour. Parasitol., 30 (1944), No. 2, pp. 112–118*).—This common blood-sucking parasite of quail in California has been reported only from *Lophortyx* spp.; the present study is based on material collected entirely from *L. californica vallicola* and deals primarily with pupal development. The flies leave their host to deposit their larvae but do not exist away from it more than 5 days; deposition may occur at any time of day. The puparium passes through a series of color stages until it becomes shining black, the process taking as long as 16 hr. The adults emerge in 61–162 days, the time for the pupal stage increasing as winter advances but not in any definite progression. Injury or contact with alcohol in the larval stage arrests but moistening with water does not prevent development. In a series of imagoes the sexes were produced in a ratio of about 1 : 1.

A community study of a disturbed deciduous forest area near Cleveland, Ohio, with special reference to invertebrates, W. W. Dowdy (*Ecol. Monog., 14 (1944), No. 2, pp. 193–222, illus. 10*).—This study refers to a man-modified area about 1.3 miles square, the approach being biotic and five communities being included; the following conclusions are drawn and a series of successional stages due to disturbance of a deciduous forest are described: Plant compositions of early stages of succession were modified by disturbance. The basic pattern of community succession was not altered by disturbance. The present stage of succession depends on the amount and kind of disturbance and the length of time since it occurred. The general phenomena of seasonal and ecological succession held for invertebrates in disturbed areas; this was true of both soil and herb faunas, as well as of ecological succession among plants. Disturbance did not seem to bring about as significant a reduction in the invertebrates as in the vertebrates. The proximity of man to the community may have little effect on reducing the number of invertebrates unless the amount of vegetation is reduced; then the number of invertebrates is reduced. During winter, temperature is the most important physical influence affecting the vertical movement of the invertebrates of the soil. Temperature and moisture acting together during summer are the most important physical factors influencing the vertical movement of the soil fauna. Invertebrates within the soil are afforded great protection during winter against outside low air temperatures; the same is true in summer against outside high air temperatures. The predominant organisms comprising the invertebrate groups of different communities are different. On the average, the number of species of invertebrates of the herb and shrub strata, taken through sweeps, was greater than that of the soil stratum taken through soil samples; the reverse was true in regard to the number of individuals. There is a significant difference between the number and kind of species found in different communities; the same is true in regard to the number of individuals. Coleoptera, Hemiptera, and Araneida seem to be the most prevalent groups within the area studied. Dipterous insects were very scarce, except mosquitoes of the genus *Aedes*. There are 62 references.

Ponds for improving stream fishing, E. V. Smith and H. S. Swingle (*Alabama Sta. Leaflet 20 (1944), pp. 7, illus. 4*).—This informatory leaflet discusses the construction and proper management of ponds on small streams as appearing to offer the best method of immediately improving stream fishing. An expanded pond program is suggested, and some ways in which ponds improve stream fishing are enumerated.

Observações sôbre o combate à Esquistosomose humana em Pernambuco, no município de Catende: Índice de infestação em Austraorbis e emprêgo da cal extinta e do sulfato de cobre no combate aos moluscos [Observations on the control of human schistosomiasis in Catende, State of Pernambuco, Brazil: Index of infestation of Austraorbis and use of slaked lime and copper sulfate in combating these snails], G. Jansen (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 335–347, illus. 14; Eng. abs., p. 347*).—A survey was made to determine the incidence of infested snails of the genus *Australorbis* by cercariae of *Schistosomum mansoni;* the high incidence of human infestation is said to be due to the constant use of rivers inhabited by these snails for bathing and other purposes. It was found that slaked lime (4–5 percent) gave better results than $CuSO_4$ in eradicating the snails, as well as being cheaper.

Doença de Chagas no Estado do Paraná, Brasil—esboço epidemiológico [Chagas' disease in Paraná, Brazil—epidemiological contribution], A. J. Pinho Simões (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 279–290, illus. 1; Eng. abs., p. 289*).—Notes on the geographic distribution of the reduviid vectors and prevalence of Chagas' disease in this region are reported. Five new localities for *Triatoma infestans* spontaneously infected with *Schizotrypanum cruzi* were found.

Verificação de flagelados semelhantes ao Trypanosoma rangeli Tejera, em Rhodnius prolixus alimentados em caso de doença de Chagas na Venezuela [Identification of flagellates like T. rangeli in the reduviid bug R. prolixus fed on a case of Chagas' disease in Venezuela], E. Dias and J. F. Torrealba (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 265–278, illus. 35; Eng. abs., pp. 276–277*).—Large crithidia morphologically like *T. rangeli* and metacyclic forms of *Schizotrypanum* were observed in the feces of laboratory-bred *R. prolixus* 65 days after feeding on a case of Chagas' disease. A strain of *Schizotrypanum* identical with that found in an inoculated guinea pig fed on the patient's blood was isolated from the intestinal contents of this infected reduviid bug. In the gut of this and other species fed on animals infected with that strain, only *S. cruzi*-like flagellates were encountered. The theory is suggested that *T. rangeli* is a *Schizotrypanum* pathogenic to man and that certain of its forms in the insect vector are rather inconstant.

Determinação da infecção natural por Schizotrypanum em Triatoma rubrofasciata no Estado de Pernambuco [Demonstration of spontaneous infection of T. rubrofasciata by Schizotrypanum in the State of Pernambuco, Brazil], E. Dias and O. Neves (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 331–334, illus. 2; Eng. abs., p. 334*).—The authors report spontaneous infection of the two reduviid bugs *T. rubrofasciata* and *Panstrongylus megistus* with flagellates of the genus *Schizotrypanum*.

Sôbre o Trypanosoma conorrhini, hemoparasito do rato transmitido pelo Triatoma rubrofasciata—presença do vector infectado na cidade do Rio de Janeiro [On T. conorrhini, hemoparasite of the rat transmitted by T. rubrofasciata—presence of the infected vector in Rio de Janeiro], E. Dias and C. A. Campos Seabra (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 301–329, illus. 95; Eng. abs., pp. 324–325*).—An adult reduviid bug (*T. rubrofasciata*) was found infected with flagellates referable to *T. conorrhini;* the detailed findings and their significance are discussed. The authors believe *T. conorrhini* to be the only species of *Trypanosoma* transmitted by reduviid bugs; a list of some 13 others species tested under experimental conditions by various authors—all with negative results—is presented.

[Entomology and the war] (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 333–361, 380–384, illus. 1*).—The following are among the papers presented in the Columbus symposium, 1943: Insect and Rodent Control in the Corps of Engineers, by W. D. Reed (pp. 333–335); Tests of New Agricultural Crop Insecticides, by E. R. McGovran (pp. 336–338), Insecticidal Aerosols, by L. D. Goodhue (pp. 338–341), New Agricultural Crop Insecticides, by H. L. Haller (pp. 342–344), Substitutes for Vegetable Insecticides, by N. F. Howard (pp. 345–346), Extension Entomology Activities in Wartime, by M. P. Jones (pp. 354–356), Influence of the War on Plant Quarantine, by E. R. Sasscer (pp. 356-359), and Protection of Stored and Dried Processed Foods and Seed Supplies From Insect Attack, by R. T. Cotton (pp. 380–384) (all U. S. D. A.); Substitute Insecticides for Fruit Crops and Ornamentals, by R. Hansberry (pp. 347–349) (Cornell Univ.); Farm Stock Insecticides, by J. A. Munro (pp. 350–351) (N. Dak. Expt. Sta.); Problems of the Victory Gardener, by T. H. Parks (pp. 351–353); and The Manpower Situation in Entomology, by E. N. Cory (pp. 360–361).

[Notes on insects and insecticides] (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 443–452*).—Contributions presented (E. S. R., 91, p. 437) are Collops [*C. hirtellus* Lec.] Feeding, and Boxelder Bug Observations, both by G. F. Knowlton (p. 443) (Utah Expt. Sta.); The Distribution of *Ctenolepisma urbana* Slabaugh and Certain Other Lepismatidae, by H. L. Sweetman and W. M. Kulash (p. 444) (Mass. and N. C. State Cols.); The Introduction and Establishment of *Habrolepis rouxi* in California, by S. E. Flanders (pp. 444–445) (Calif. Citrus Sta.); Toxicity Tests of Certain N-Substituted Benzamides Against Codling Moth Larvae, by E. H. Siegler and S. I. Gertler (p. 445), Damage to Red Pine and Jack Pine in the Lake States by the Saratoga Spittle Bug [*Aphrophora saratogensis* (Fitch)], by H. C. Secrest (pp. 447–448), Chemicals to Destroy Overwintering Codling Moth Larvae in the Soil at the Base of Apple Trees, by M. A. Yothers and F. W. Carlson (pp. 448–450), Experimental Parasitization Studies With the Comstock Mealybug (p. 450) and Hyperparasitization of *Clausenia purpurea* Ishii, an Important Parasite of the Comstock Mealybug (pp. 450–451), both by D. W. Clancy, and Fumigation of Elm Wood Containing Adults of *Hylurgopinus rufipes* Eich., by H. C. Donohoe (p. 452) (all U. S. D. A.); Notes on the Occurrence of *Anopheles georgianus* King in Louisiana, by W. W. Wirth (p. 446); Bee Breeding in January, by W. C. Roberts (p. 446) (Univ. Wis. coop. U. S. D. A.); Introduced Lady Beetles on Mona Island, by G. N. Wolcott and L. F. Martorell (pp. 451–452) (P. R. Univ. Sta.); and An Unusual Egg Deposition by a Queen Honeybee, by E. Braun (p. 452).

Bibliography on insect pest resistance in plants, with a supplement on resistance to nematodes (*Cambridge, Eng.: Imp. Bur. Plant Breeding and Genet., 1944, pp. 39*).—Literature references relating to insects and nematodes are listed by host plants attacked.

Agricultural insecticides, [I], II (*Soap and Sanit. Chem., 19 (1943), No. 12, pp. 121, 123, 125, 143, illus. 2; 20 (1944), No. 1, pp. 119, 121, 123*).—A review of recent reports of various State agricultural experiment stations, indicating that much work is now being concentrated on the search for effective substitutes for insecticides in short supply and on the development of application technics that will make more economical use of such supplies as are available.

Peet-Grady method: [Official method of the National Association of Insecticide and Disinfectant Manufacturers for evaluating liquid household insecticides] (*Blue Book [Soap and Sanit. Chem.], 1944, pp. 201–204*).

El uso de los compuestos del flúor como insecticidas [The use of fluorine compounds in insecticides], C. Gutiérrez (*Fitófilo, 2 (1943), No. 5, pp. 69–112, illus.* 2).—Includes 30 literature references.

Further refinement of a technique for testing contact insecticides, W. S. McLeod (*Canad. Jour. Res., 22 (1944), No. 4, Sect. D, pp. 87–104, illus. 3*).—When *Drosophila melanogaster* was sprayed with nicotine sulfate solution by both intermittent and continuous methods, no clearly demonstrated superiority of one technic over the other was observed. An analysis of variance performed on observed mortalities expressed as angles of equal information showed that increasing age of flies, increasing number of flies per cage, longer delays between filling of cages and spraying, and increased proportion of ♂♂ in the samples raised the observed mortalities significantly. Data on fly ages and numbers per cage were also put through the probit analysis of Bliss, which indicated that those 5 days old are most susceptible and that fly numbers affected equally the mortalities due to all concentrations. The type of cloth used to cover the cages should be standardized.

Relative effects of several base oils used in livestock sprays on the skin of cattle, F. W. Atkeson, A. R. Borgmann, R. C. Smith, and A. O. Shaw. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 419–428*).—Comparisons of livestock sprays by the skin reactions of dairy cows in the first of the 2 yr. of this study included a widely used commercial preparation, two widely used base oils, and several combinations of toxic ingredients in one of the base oils. Each animal was sprayed daily for 30 consecutive days at about 40 cc. per 1,000 lb. of live weight; even the worst skin reaction was not serious, but noticeable differences were observed. In the second year, comparisons of 17 base oils were made under more controlled conditions by spraying four selected areas on the same animal with 4 different oils, applications also being made daily for 30 days. Spraying 5 cc. on 2 sq. ft. of animal failed to reveal differences in the oils (two exceptions); use of 10 cc., however, brought out marked differences among them. Observations on the thirtieth day revealed that 8 of the oils were noticeably more harmful than the other 9. The best index of the effect on the skin was found to be the unsulfonated residue content of the oils; those containing 92.5–100 percent included all the most satisfactory oils (one exception), while oils containing 87.5 percent or less gave the most unsatisfactory skin reactions. Contrary to published statements, the Saybolt viscosity of an oil did not prove a reliable index of skin reaction in these tests. Factors other than skin tests would need consideration in selecting base oils for livestock sprays, but these findings show the possibility of minimizing harmful effects to the skin by proper choice of oils.

Comparative toxicity under barn conditions of livestock type fly sprays made from various combinations of toxic ingredients and base oils, F. W. Atkeson, R. C. Smith, A. R. Borgmann, and H. C. Fryer. (Kans. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 428–435*).—The 16 livestock sprays compared for relative toxicity in dairy barns included 2 commercial sprays and 14 of known composition; each was used at the rate of 1 cc. per 36 cu. ft.—approximately half the amount prescribed for the Peet-Grady test. The following conclusions are believed justified: In barn spraying tests knock-down counts need not be taken after 5 min. In general, the 16 sprays varied widely in knock-down efficiency, but the top 5 sprays were about equal; highly significant (odds 99 : 1) differences existed between the better and the poorer sprays. Lethane and Thanite were among the best toxicants in knock-down; pyrethrum was least so but when fortified with D. H. S. Activator it was among the best at concentrations of 3.75 percent or more of a 20 : 1 concentrate. There was some indication that low viscosity oils are superior in knock-down effect to those of higher viscosity. The 16 sprays varied almost as much in killing as in knock-down efficiency, but the 4 top-ranking ones were equal. Thanite was the best in killing power of any single toxicant used in base oil; in water it was less efficient, but the difference between it and the 4 lowest ranking base oil sprays was highly significant. Pyrethrum and Lethane were among the least efficient in killing power, but when D. H. S. Activator was added to pyrethrum sprays containing 3.75 percent or over of a 20 : 1 concentrate they ranked among the most efficient. Differences in results were obtained with sprays made from different base oils, but the available data do not reveal which of the oil properties were responsible. Three of the 4 best sprays in kill were among the 5 best in knock-down, and 3 of the 4 poorest ones in kill were also among the poorest in knock-down; others varied widely in relative rank for kill and knock-down. The results of this study indicate the importance of a lethal dosage at the time of knock-down and show that the percentage of kill is a better measure of the toxicity of a livestock spray than that of the knock-down.

Activation of pyrethrins in fly-sprays, W. A. L. David and P. Bracey (*Nature [London], 153 (1944), No. 3889, pp. 594–595*).—An accepted method of "stretching" limited supplies of pyrethrins is to add to the spray a small proportion of a material which, though not in itself insecticidal, yet has the property of making the pyrethrin spray more effective. Four such adjuvants or activators were tested on the yellow-fever mosquito, with the conclusions that they delay the occurrence of "knock-down" and so prolong the period of flight through the mist, the insect picks up its dose of insecticide by impaction with the spray droplets during its flight, the rate of movement of the insect in relation to the droplet and the relative momenta are important factors in the results, and the activators used have a very marked effect on the particle size and persistence of the insecticidal test. The effectiveness of activating insecticidal sprays by the method outlined is illustrated by detailed results from the use of isobutyldecylenamide.

Action of inert dusts on insects, V. B. Wigglesworth (*Nature [London], 153 (1944), No. 3886, pp. 493–494, illus. 2*).—From observations, mainly on the bug *Rhodnius* but confirmed with other insects, it appeared that an important factor in the action of dusts is simple abrasion of a film of wax which lies outside the epicuticle, thus allowing the desiccation of the insect. It has also often been noted that certain dusts favor the action of insecticides; perhaps this is owing to their abrasive or adsorptive properties. It may therefore be desirable deliberately to incorporate abrasive material as an adjuvant in insecticidal dusts.

Action of inert dusts on insects, H. Kalmus (*Nature [London], 153 (1944), No. 3893, pp. 714–715*).—A note on experiments which appear to confirm the results reported by Wigglesworth (see preceding entry).

Anthropomorphism in insect psychology, P. Rau (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 201–206*).—A plea for sanity in the approach and in the use of language in this field of study.

Group motor responses of adult and larval forms of insects to different wavelengths of light, H. B. Weiss, E. E. McCoy, Jr., and W. M. Boyd (*Jour. N. Y. Ent. Soc., 52 (1944), No. 1, pp. 27–43, illus. 5*).—This paper, the fifth of a series (E. S. R., 89, p. 337), reports on the responses of 7 species of beetles and of 16 species of lepidopterous, hymenopterous, and coleopterous larvae to 10 wavelength bands of light of equal physical intensities, in disarray, from 3,650 to 7,400 a. u. The tests were run in a sector type equipment described in the third and fourth papers of the series.

The external morphology of the oblong-winged katydid Amblycorypha oblongifolia (DeGeer) (Orthoptera: Tettigoniidae), S. Kramer. (Mass. State Col.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 167–192, illus. 26*).

A study of a gynandromorph of Melanoplus mexicanus mexicanus (Sauss.) (Orthoptera), H. C. Severin. (S. Dak. Expt. Sta.). (*Jour. N. Y. Ent. Soc., 51 (1943), No. 3, pp. 179–182, illus. 1*).

Colour changes in Mantis religiosa L., H. G. James (*Canad. Ent., 76 (1944), No. 6, pp. 113–116*).—All the data considered from the literature and the experiments described seem to indicate that the color of the mantids in the field is closely related to that of the plant cover. Tests with colored boxes supported the hypothesis that the color of the substratum and the quality of its reflected light are the factors influencing and determining the color phases of the mantids.

New muscoid Diptera from the United States, H. J. Reinhard. (Tex. Expt. Sta.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 2, pp. 57–72*).—Most of the new forms described were encountered in a study of some recent additions of Tachinidae to the Snow Entomological Collections, University of Kansas.

Notes on the parasitic habits of Muscina stabulans (Fall.) (Diptera: Muscidae), A. F. Satterthwait. (U. S. D. A.). (*Jour. N. Y. Ent. Soc., 51 (1943), No. 3, pp. 233–234*).

Suggestions for grouping the families of acalypterate cyclorrhaphous Diptera on the basis of the male terminalia, G. C. CRAMPTON. (Mass. State Col.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 6, pp. 152–154*).

Lygus Hahn: Six new species from western North America (Hemiptera: Miridae), H. H. KNIGHT (*Iowa State Col. Jour. Sci., 18 (1944), No. 4, pp. 471–477*).—The growing importance of *Lygus* spp. as pests of leguminous crops has prompted further studies of this genus; six new species and one variety are here described.

A revised classification of the Reduvioidea, with a new subfamily from South America (Hemiptera), R. L. USINGER. (Univ. Calif.). (*Ann. Ent. Soc. Amer., 36 (1943), No. 4, pp. 602–618, illus. 3*).—Includes phylogenetic and identification keys to the families and subfamilies of the reduvioid bugs, with a new subfamily and a new genus.

A case of parental care in the Heteroptera, S. W. FROST and V. R. HABER. (Pa. State Col.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 161–166, illus. 10*).—The authors discovered and here describe a marked case of parental care in a species of Pentatomidae, *Meadorus lateralis* (Say), along with its geographical distribution and life history stages.

A catalogue of Oregon Coccinellidae, B. MALKIN (*Jour. N. Y. Ent. Soc., 51 (1943), No. 3, pp. 191–198*).—This annotated list contains 78 species and 15 varieties of ladybird beetles.

Feeding habits of two mealybugs, Pseudococcus comstocki (Kuw.) and Phenacoccus colemani (Ehrh.), E. H. GLASS (*Virginia Sta. Tech. Bul. 95 (1944), pp. 16, illus. 16*).—The feeding habits of the Comstock mealybug were studied on leaves and wood of apple, Irish potato sprouts, and sweetpotato stems. Similar studies were made of *P. colemani* on geranium leaf petiole, sweetpotato leaf, and calla lily leaf. These mealybugs were found to have similar feeding habits. Bristles usually followed an intracellular path and sought out phloem tissues. In some instances the bristles probed in several directions in order to find a suitable tissue without being completely withdrawn. A sheath similar to that described for other plant-sucking insects was found about the bristles. Since these sheaths remained after the bristles were withdrawn, the former location of the bristles was indicated. On stained material the cell walls were stained green, the sheath bright red, and the bristles took neither stain.

Biology of Allotropa burrelli, a gregarious parasite of Pseudococcus comstocki, D. W. CLANCY. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 4, pp. 159–167, illus. 2*).—The introduction of *A. burrelli* Mues. into the United States from Japan was begun in 1939 for propagation and release against the Comstock mealybug in eastern apple orchards. Biological observations have shown that development is normally monembryonic, although twinning may rarely occur. The parasite body, which becomes closely associated with the host fat body, increases approximately 24 times during incubation, nourishment being elaborated by the trophamnion with its paranuclear masses. The larval state is correspondingly reduced to a single instar with one pair of anterior spiracles and unusual mouth parts. From 1 to 22 adult parasites issued per host, of which 67–75 percent were females. All nymphal stages of the host are attacked, and ovarian dissections disclosed an average of 565 eggs per female. The life cycle ranged from 26 to 38 days, with an average of 31 days at 75°–80° F. Overwintering occurs as mature larvae within the mummified mealybug body.

Head-capsule measurements of southern armyworm larvae (Prodenia eridania (Cramer)), E. L. MAYER and F. H. BABERS. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 214–220, illus. 2*).—Measurements of the head-capsule sizes of over 2,000 larvae of all stages of the southern armyworm were made and found to vary between 0.24 and 2.99 mm. The detailed data were statistically examined, and it is concluded that growth ratios tend to fall in geometric progression, and that with this species there are only six instars. A sharp break in the plot of the mean head-capsule widths occurred at the third instar, the points apparently following regular progressions above and below this break. The break may correspond to a definite change in the physiological state of the insect.

The imported long-horned weevil Calomycterus setarius Roelofs, J. P. JOHNSON (*Connecticut [New Haven] Sta. Bul. 479 (1944), pp. 119–142, illus. 16).*—*C. setarius,* the imported long-horned weevil, which is a native of Japan, has become established in Connecticut, Illinois, Iowa, Maryland, Massachusetts, New York, Pennsylvania, and Rhode Island. The adults, which are wingless and parthenogenetic, emerge from the soil about June 25 and become most abundant during July and early August. Eggs are deposited in soil or debris. Larvae are present in the soil from July until the following June. Pupation takes place in June or early July. Adults feed on leaves and blooms of numerous plants, while the larvae apparently eat small roots and organic matter. A dust containing 25 percent cryolite with pyrophyllite gave good control.

The black flea beetles of the genus Epitrix commonly identified as cucumeris (Harris) (Coleoptera: Chrysomelidae), L. G. GENTNER. (Oreg. Expt. Sta.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 6, pp. 137–149*).—Examination of large series of specimens and study of the published literature (91 references) led to the conclusion that there are at least three distinct species involved—*E. cucumeris* and two others here described as new.

Notes on the habits and life-history of the leaf-eating brown weevil Phyllobius pyri L. (Col.: Curculionidae), F. H. JACOB (*Ent. Mo. Mag., 4. ser., 5 (1944), No. 52, pp. 78–79*).

A key to the genus Acanthognathus Mayr, with the description of a new species (Hymenoptera: Formicidae), M. R. SMITH. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 6, pp. 150–152*).

The North American species of Ancistrocerus, proper (Hymenoptera: Vespidae), J. BEQUAERT (*Ent. Amer., 23 (1943), No. 4, pp. 225–286, illus. 4*).—A taxonomic monograph, including new nomenclature and identification keys.

A new species of Bracon (Hymenoptera: Braconidae) from Kansas, R. D. SHENEFELT. (Wash. State Col.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 2, pp. 74–76*).—*B. pascuensis* n. sp. is described.

The genus Cressochilus Banks (Hymenoptera: Pompilidae), J. C. BRADLEY. (Cornell Univ.). (*Canad. Ent., 76 (1944), No. 7, pp. 150–152*).—Four species (two new combinations) and a key are included.

The relationship of Dasymutilla permista Mickel to Dasymutilla quadriguttata (Say) and behavior notes on the species, C. L. REMINGTON (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 198–200*).—The great dissimilarity of the sexes in members of the Mutillidae (the velvet ants) makes it frequently impossible to connect ♂♂ and ♀♀ by study of preserved specimens. A ♂ of *D. permista* was seen to mate with a ♀ *D. quadriguttata;* these therefore appear to be one species and the first, being the older name, must stand. The habits are briefly described. The great abundance of *Myzine quinquecincta* (F.) on the lawn with the mutillids, coupled with the reported rearing of *D. quadriguttata* from *M. quinquecincta* cocoons, leads the author to believe that the tiphiid is the host of the mutillid under the conditions where this study was made.

The genus Dinocnemis Banks (Hymenoptera: Pompilidae), J. C. BRADLEY. (Cornell Univ.). (*Canad. Ent., 76 (1944), No. 6, pp. 131–132*).—Three species—with keys and including two new combinations—are considered.

The genus Melecta in eastern North America and Porto Rico (Hymenoptera: Anthophoridae), E. G. LINSLEY. (Univ. Calif.). (*Jour. N. Y. Ent. Soc., 51 (1943), No. 3, pp. 225–227*).—Hitherto unknown east of the Mississippi River, one new species of this bee is described from Georgia, one is redescribed from Puerto Rico, and the easternmost record for *M. californica* Cresson on the bank of the Mississippi River is noted.

The causes of the occasional abundance or scarcity of wasps (Vespula spp.) (Hym.: Vespidae), B. P. BEIRNE (*Ent. Mo. Mag., 4. ser., 5 (1944), No. 54, pp. 121–124, illus. 2*).—During 1864–1931 there are said to have been 10 seasons when wasps were abnormally abundant throughout England and Wales in the summer and fall and 10 when they were abnormally scarce. Their abundance appeared to occur irrespective of the numbers of queens in the spring. In seasons of abundance the rainfall during April-June was low, whereas in seasons of scarcity it was high. Seasons of abundance and scarcity usually appeared in pairs. It is believed possible that in seasons of wasp scarcity, disease, which often destroys a large proportion of the larvae, becomes correspondingly scarce, and as it does not increase at the same rate as the wasps the latter become relatively abundant in the following year, whereas in seasons of wasp scarcity the reverse takes place.

Diapause in the parasitic Hymenoptera, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 408–411*).—If the development of an introduced species includes a diapause not synchronized with that of its host its establishment obviously may be impossible. The necessary synchronization of development between such a host and its parasite may possibly be brought about either by artificially prolonging the diapause in one or the other, or by manipulation of the environal conditions that initiate or break the diapause. Since the diapause may affect the utilization of hymenopterous parasites, the author has deemed it advisable to review and correlate the various arrests of development known to occur in this group in order to facilitate future studies of the phenomenon.

Insect problems of field-crop seed production in the West, C. J. SORENSON. (Utah Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 371–376*).—The leading field crops grown for seed in the western United States are alfalfa, clovers, vetch, corn, wheat, barley, oats, sugar beets, and cotton. Major insect problems encountered in growing the seed of these crops are the following: Alfalfa and clover—*Lygus* bugs, the seed chalcid, grasshoppers, superb plant bug, alfalfa plant bug, the Say stinkbug, alfalfa weevil, thrips, clover seed midge, and clover aphid; vetch—the vetch bruchid, pea aphid, pea moth, and the sitona weevil; corn—the corn earworm, corn rootworm, European corn borer, chinch bug, grasshoppers, aphids, and spider mites; small grains—grasshoppers, chinch bug, hessian fly, strawworms, jointworms, the pale western cutworm, and the Say stinkbug; sugar beets—*Lygus* bugs, beet leafhopper, pentatomids, thrips, and false chinch bug; cotton—*Lygus* bugs, western cotton plant bug, and pentatomid bugs; and grain sorghum—southwestern corn borer, the lesser cornstalk borer, and aphids. Problems presenting the greatest difficulty and on which additional investigations are most urgently needed are the prevention or control of *Lygus* bugs, thrips, and the Say stinkbug in seed alfalfa, the seed chalcid in alfalfa and clover seed, and the false chinch bug when it attacks any crop. More information is also needed on the relationships of thrips to alfalfa seed development and of bees—both honeybees and wild bees—to tripping and pollination in alfalfa.

Insects affecting vegetable seed crops in the Western States, L. G. SMITH. (Wash. State Col.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 362–370*).—Some 78 insect species are said to affect the production of 21 vegetable seed crops grown in the western United States; the industry is comparatively new in this region, and in many instances the extent of insect damage to seed crops and the methods of control have not yet been determined. Though the maximum infestation by the pea weevil has been as high as 85.5 percent, the average is usually held to less than 5 percent by the timely application of rotenone dust. The pea moth causes severe damage to peas grown in northwestern Washington; no control measures are as yet known. The weevil *Sitona lineata* Lec.—recently introduced into Washington—attacks peas, vetch, and alfalfa. The pea aphid is a problem mainly in the coastal areas of the Pacific Coast States. The cabbage seed pod weevil destroys about 25 percent of the seed crop each year in this State, and no satisfactory control is known; the cabbage aphid and the cabbage maggot also seriously affect cabbage seed production.

Testing wheats in the greenhouse for hessian fly resistance, W. B. CARTWRIGHT and D. W. LAHUE. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 385–387, illus. 2*).—Because of the difficulties in obtaining significant results with field trials the authors have resorted to the testing of wheat varieties for hessian fly resistance under controlled conditions in the greenhouse; the method here described in detail has proved a satisfactory substitute for field trials because dependable populations of flies can be made available, the testing period is more elastic, and several thousand wheat strains can be tested and retested in a relatively small area and with but little equipment.

The lesser cornstalk borer, a pest of fall beans, D. ISELY and F. D. MINER. (Univ. Ark.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 2, pp. 51–57, illus. 1*).—Ordinarily considered a minor pest, this borer destroyed several thousand acres of seedling fall beans in northwestern Arkansas in August 1943; practically all its other hosts in this area were also infested. Most of the injury to seedling beans appeared to be due to partly grown larvae developed in the fields on previous crops or weed grasses. Destruction of these hosts 3–4 weeks before planting is the most obvious means of avoiding such damage; field observations prior to the planting of beans are suggested as a means of determining the need of preventive measures.

Gusano del elote: Descripción y procedimientos de control [The corn earworm: Description and means of control] (*Fitófilo, 2 (1943), No. 4, pp. 35–59, illus. 7*).

Insects affecting guayule, with special reference to those associated with nursery plantings in California, W. H. LANGE, JR. (Calif. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 392–399, illus. 3*).—The main purpose of this contribution is to present information collected during 1942 on insects causing injury to nursery and field plantings of guayule in the Salinas Valley. An attempt has also been made to tabulate the insects injuring this plant in other areas of the State and elsewhere, so that this information may be readily available. Contrary to the general belief, guayule has a large fauna of associated insects and several have caused damage in localized areas of the nurseries; these infestations have not as yet assumed major importance, but where optimum production of plants is the objective their control is a necessity. Among the pests discussed are *Diabrotica 11-punctata* (Mann.), wireworms, leafhoppers, thrips, *Estigmene acraea* (Drury), *Agromyza virens* Loew, *Ligyrus californicus* Csy., grasshoppers, *Lygus* bugs, *Pityophthorus nigricans* Bland, *Rhizaspidiotus dearnessi* Ckll., and a gall fly. The physiological responses of guayule to insecticides and fungicides are briefly discussed.

Potato flea beetle control in western Nebraska, R. E. HILL and H. D. TATE (*Nebraska Sta. Bul. 361 (1944), pp. 23, illus. 7*).—Damage to potato tubers by larvae of the flea beetle *Epitrix tuberis* Gentner is more important than foliage injury by adults in western Nebraska. Larval damage is frequently accompanied by severe scab infection. Adults start leaving overwintering quarters in mid-May and continue to appear during June. This period coincides with the early growth of potatoes planted before June 10. The first generation develops largely in the early plantings, from which they migrate during July and August into the late (or principal) crop to lay eggs, and the larvae (second generation) which hatch from these attack tubers of the late crop. First-generation adults appear in early July and those of the second about August 10. Adults feed on several wild hosts, but larvae feed largely on solanaceous plants.

Tests to date with various insecticides, including zinc arsenite sprays, cryolite dust, and barium fluosilicate dust, indicate that these materials are about equally effective. The addition of sulfur to other insecticides is thought desirable from the viewpoint of potato psyllid control. The authors suggest elimination of early plantings, destruction of cull dumps, combining late with early plantings, and frequent and thorough insecticide applications to reduce flea beetle damage in western Nebraska.

The potato [tuber] moth: Experiments on its control, N. C. Lloyd (*Agr. Gaz. N. S. Wales, 54 (1943), Nos. 7, pp. 323–327, 337, illus. 3; 9, pp. 417–421, illus. 4; 55 (1944), Nos. 3, pp. 107–110, 126; 5, pp. 193–196*).—This paper summarizes the life history studies and control experiments with this pest in stored tubers, as carried out during the past 3 yr. Pyridine dust (5 percent) proved of great value in protecting potatoes against infestation, provided a good coating is obtained, but it will not control larvae already in the tubers. Further work is necessary to compare more fully the performance of kaolin, magnesite, pyridine, and derris dusts on a large scale and under conditions favorable to the moth, i. e., during warm weather. Results from liquid dips have been disappointing because of their failure to prevent reinfestation by succeeding generations of moths.

The external morphology of the adult tobacco hornworm (Lepidoptera: Sphingidae), A. H. Madden. (Mass. State Col.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 145–160, illus. 19*).—A detailed morphological description of the adult is presented as an example of the structure of the entire family.

[Insect pests of orchard fruits] (*Wash. State Hort. Assoc. Proc., 39 (1943), pp. 43–47, 103–114, illus. 1*).—The following papers are included: Insects of Soft Fruits, by L. G. Smith and W. A. Luce (pp. 43–46) (Wash. State Col.); Relative Value of Sulphur and of Oil in Control of Mites, by R. E. Smith (pp. 103–106); Controlling the Codling Moth With Nonarsenicals, by E. J. Newcomer, M. A. Yothers, F. P. Dean, C. C. Alexander, and F. W. Carlson (pp. 107–110) (U. S. D. A.); and Timing Sprays for Codling Moth Control, by W. J. O'Neill (pp. 111–114) (Wash. Expt. Sta.).

Toxicity of ricin, ricinine, and related compounds to codling moth larvae, E. H. Siegler, M. S. Schechter, and H. L. Haller. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 416–418*).—Investigation of the toxicity of ricin and ricinine from the castor-bean plant, synthetic ricinine, and eight closely related compounds to codling moth larvae revealed only two of them to be effective killing agents, viz, ricinine (1,2-dihydro-methoxy-1-methyl-2-oxonicotinonitrile) and 1,2-dihydro-1,4,6-trimethyl-2-oxonicotinonitrile. The structural formulas of both these compounds show a methyl group attached to the heterocyclic N atom and no free hydroxyl group attached to the ring.

Mass liberation of parasites for immediate reduction of oriental fruit moth injury to ripe peaches, M. H. Brunson and H. W. Allen. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 411–416*).—Studies of the effects of mass liberations of parasites to control the oriental fruit moth were made in nine groups, of peach orchards in southern New Jersey (1938–42), covering over 360 acres during the period and including check-orchard observations on an additional 313 acres. *Macrocentrus ancylivorus* Roh. and *Bassus diversus* Mues. were liberated in 1938–39, but only the former in 1940–42. Although some parasites were liberated on first-brood larvae, the greater number were released in orchards during the occurrence of the second brood. Over the 5-yr. period an average of 47 percent less fruit was injured per tree in the treated than in the check orchards. Supplementary evidence substantiated the conclusion that the observed reduction in injury was due to the parasites released. Parasitization of the second-brood larvae averaged higher in the orchards receiving parasite liberations than in the check orchards. The species liberated comprised a larger proportion of the total parasites reared from second-brood larvae collected in the orchards receiving liberations than from second-brood larvae collected in the checks. The number of moths emerging per tree from second-brood larvae was less in the orchards receiving parasite releases than in the checks. It is concluded that the mass liberation of parasites, chiefly *M. ancylivorus,* increased the parasitization of second-brood oriental fruit moth larvae, lowered the number of second-brood moths escaping parasitization, and thus reduced the fruit injury by about 50 percent.

Insect pests of strawberries in Ohio, R. B. NEISWANDER (*Ohio Sta. Bul. 651 (1944), pp. 37+, illus. 15*).—This publication includes a detailed discussion of the strawberry leaf roller, with particular reference to its damage; life history; emergence; egg deposition; incubation, larval, and pupal periods; length of life cycle; parasitization; and control studies for the years 1936 through 1943. In the control studies, both natural and synthetic cryolite proved economical and effective. Applications in dust form proved superior to sprays in four out of five tests. Cryolite dusts appeared most satisfactory when diluted with 2 parts talc and 2 parts flour.

Information is included on the strawberry leaf beetle (*Paria* sp.) and the grape colaspis. For the former, proper cultural practices proved the most economical control. When adults of the grape colaspis cause injury, control may be accomplished by application of a dust containing 1 part Dutox, 2 parts talc, and 2 parts flour.

Control measures are also suggested for the strawberry crown borer, white grubs, spittle bugs (*Philaenus leucophthalmus* (L.)), and the common red spider *Tetranychus bimaculatus* Harvey. A new type of strawberry injury caused by a hemipterous insect, *Myodochus serripes* Oliv., is described.

Minor strawberry pests which occur in Ohio are also discussed. Leaf rollers, strawberry weevils, strawberry root weevils, strawberry root aphids, cyclamen mites, strawberry sawflies, and cutworms are included in this group.

Twenty-six selected citations to the literature are included.

The western grape leaf skeletonizer Harrisina brillians in California, W. H. LANGE, JR. (Calif. Expt. Sta.). (*Calif. Dept. Agr. Bul., 33 (1944), No. 2, pp. 98–104, illus. 5*).—This pest was first reported from San Diego County in 1941; although it now appears that its attacks are sporadic and do not threaten the grape industry in this State, the importance of keeping it from spreading to other grape areas is apparent. The chief purpose of this paper is to describe and present illustrations of all stages so that the moth and immature stages can be readily differentiated by growers. The species is known in Arizona, California, Colorado, and Utah. The results of spray tests against half- to full-grown larvae are tabulated.

Control biológico de la mosca prieta de los cítricos en la República [Biological control of the citrus blackfly in Mexico], A. DELGADO DE GARAY (*Fitófilo, 2 (1943), No. 5, pp. 3–17, illus. 4*).

Pecan nut casebearer control, H. HINRICHS, G. A. BIEBERDORF, and F. B. CROSS. (Okla. Expt. Sta. et al.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 123–128, illus. 2*).—In a 2-yr. spray test against the pecan nut casebearer, two applications containing 4 lb. of lead arsenate, 3 qt. of summer oil, and 1 pt. of nicotine sulfate to 100 gal. of water proved most effective. Sprays must be properly timed for best results; when delayed a week or more they were not effective. A single spray of 6 lb. of lead arsenate and 3 qt. of summer oil to 100 gal. of water gave promising results in 1943. Dormant spraying with dormant oils and Dinitro and summer applications of fixed nicotines have shown possibilities but need further testing. All the spray mixtures used increased production by decreasing the casebearer population, but under severe infestation the most extensive and thorough methods are necessary to gain control of this pest.

Insectos que atacan a los productos alimenticios almacenados [Insects attacking stored food products], E. G. LINSLEY and E. MICHELBACHER. (Univ. Calif). (*Fitófilo, 2 (1943), No. 5, pp. 18–68, illus. 21*).—This compendium on these pests and their control is a translation of California Station Bulletin 676 (E. S. R., 89, p. 563).

Studies on Tribolium confusum Duval.—III, Abnormalities produced in Tribolium confusum Duval by exposure to acetic and hydrochloric acids, L. M. ROTH (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 235–254, illus. 42*).—When various stages of the confused flour beetle were subjected to the vapors of acetic acid the results were more or less similar to those obtained with vapors of the odoriferous substance given off by the adults. In the present study, a detailed analysis is presented of the types of abnormalities produced. The type of deformity induced was found to be determined by the developmental stage at time of treatment, and this type changed with a change in the developmental stage. Glacial acetic acid and various concentrations of HCl were also applied directly to different stages of this insect, the results being essentially the same as those obtained by the acetic acid vapors. In only one case was an accessory outgrowth induced and never were any duplications or triplications obtained.

Protection of dried packaged foodstuffs from insect damage, E. G. LINSLEY. (*Univ. Calif.*). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 377–379*).—No commercially available glass- or metal-substitute packages are known to be proof against all insect pests. The best commercial package thus far tested is a heavy fiberboard carton dipped twice in thermoplastic wax; this could be improved by closer attention to cutting and assembling the carton to provide tighter fitting seams and more careful dipping for a smoother, more uniform, bubble-free wax coverage. Repellents offer promise of increasing the usefulness of the various wax- and paper-coated packages; among the better materials thus far investigated are the dinitrocresol compounds. Dehydrated foodstuffs, in spite of their low moisture content, are subject to insect damage and infestation; they require essentially the same protection afforded air- and sun-dried products.

Recirculation in atmospheric fumigation of commodities with nitriles, E. H. GLASS. (Ohio State Univ. et al.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 388–391, illus. 3*).—Laboratory and large-chamber fumigations with acrylonitrile-carbon tetrachloride and trichloroacetonitrile-acrylonitrile mixtures were made to study the possible value of recirculation in atmospheric chambers. Several comparable dosage-mortality curves for the confused flour beetle, with and without circulation, demonstrated that recirculation did not increase the effectiveness of fumigations in a 6-l. chamber under the experimental conditions. In 11 further tests in a 740-cu. ft. atmospheric chamber, recirculation also failed to increase the effectiveness of the fumigations. The trichloroacetonitrile-acrylonitrile mixture (70–30) was not only more toxic than the acrylonitrile-carbon tetrachloride mixture (50–50), but the vapor of the former appeared to penetrate deeper into flour in lethal concentrations.

Insect attack and damage to white-pine timber after the 1938 hurricane in New England, H. A. BESS. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 1, pp. 14–16*).—Bark beetles and borers were abundant enough in the spring of 1939 to infest the susceptible timber in this hurricane area. Pinhole borers were relatively scarce the first season after the storm but were conspicuously abundant in 1940. In some areas 70 percent of the wind-felled trees had many of their roots intact and were still green and undamaged by insects at the end of the second season, indicating that it may be feasible to continue salvage operations more than one season after a storm and especially if the most vulnerable timber is logged first. Practically no standing trees were killed by bark beetles after the storm. Water storage of logs gave good protection against insects and stains, and those examined on dry sites some distance from wind-felled trees were injured comparatively little by insects during 1939. Chemicals applied to the green logs gave some protection, but covering the decked logs with straw and boughs proved more effective.

Powder-post beetles and their control, T. E. SNYDER. (U. S. D. A.). (*Pests, 12 (1944), No. 4, pp. 8, 27–31, illus. 7*).—The information on powder-post beetles discussed in detail and briefly summarized in tabular form should aid in quickly associating each species, the damage it causes, and the measures that may be used against it.

Parthenogenesis in termites of the genus Zootermopsis, S. F. LIGHT (*Calif. Univ. Pubs. Zool., 43 (1944), No. 16, pp. 405–412*).

A new termite, Calotermes (Calotermes) curvithorax n. sp., from Canton Island, in the Phoenix Group, Pacific Ocean, J. M. KELSEY (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 2, Sect. B, pp. 45–53, illus. 3*).

How to make wood unpalatable to the West Indian dry-wood termite Cryptotermes brevis Walker.—II, With organic compounds, G. N. WOLCOTT. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv. Caribbean Forester, 5 (1944), No. 4, pp. 171–180; Span. abs., pp. 179–180*).—In further studies (E. S. R., 90, p. 77), the constituents of coal-tar creosote found most valuable for making wood permanently resistant at high dilutions to attack by *C. brevis* were phenol, phenanthrene, fluoranthene, and pyrene. Phenol was the only one of these abundant and cheap enough for commercial use. Its value was increased by synthesizing to pentacholoro-phenol, which at 0.5-percent concentration gave permanent protection. Cedar oil and crude cashew-nut oil at 5-percent strength proved permanently repellent. Ferric dimethyl-dithio-carbamate was found permanently resistant at 0.2-percent strength.

Protection of buildings from termite damage, with special reference to wartime conditions, N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Pests, 12 (1944), No. 6, pp. 6, 8, 10*).—This paper presents pertinent information on the biological background of *Reticulitermes floripes* Kol—the species found in the Northeastern States—and its control.

A handbook for the identification of insects of medical importance, J. SMART (*London: Brit. Mus. (Nat. Hist.), 1943, pp. 269+, illus. 191*).—The chapter on fleas is by K. Jordan and that on arachnids by R. J. Whittick.

Nota sôbre os transmissores da moléstia de Chagas ocorrentes no Estado do Maranhão, Brasil [Notes on the vectors of Chagas' disease in the State of Maranhão, Brazil], C. MIRANDA (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 297–300; Eng. abs., p. 299*).—Two reduviid bugs, *Panstrongylus megistus* (Burmeister) and *Triatoma rubrofasciata* (DeG.), are noted as transmittors in addition to *P. geniculatus* (Latr.), already known in this region.

The flea Malaraeus telchinum a vector of P. pestis, A. L. BURROUGHS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 10–11*).—This flea was found by far the most numerous on *Microtus californicus,* and it outnumbered *Nosopsyllus fasciatus* about 2 to 1 on *Rattus norvegicus. Opisodasys nesiotus* was slightly more numerous than *Malaraeus telchinum* on *Peromyscus maniculatus.* Since *M. telchinum* was the only flea found to parasitize all three rodent species, it was deemed imperative to make transmission tests of *Pasteurella pestis;* in the 10 thus far completed, 4 positive transmissions were obtained.

Fumigation as a method of controlling the body louse Pediculus humanus corporis De Geer, I, II, W. A. L. DAVID (*Bul. Ent. Res., 35 (1944), No. 1, pp. 79–89, illus. 2*).—A method for fumigation experiments has been worked out, and preliminary tests of 21 substances are reported upon.

A bibliography of keys to immature mosquitoes (Diptera: Culicidae), W. P. HAYES. (Univ. Ill.). (*Ent. News, 55 (1944), Nos. 6, pp. 141–145; 7, pp. 183–189*).—The classification of mosquito eggs, larvae, and pupae has assumed increasing importance because of the intensive wartime malarial control program; this contribution should aid in identification work.

A note on the mosquito distribution records of Puerto Rico and of the Virgin Islands (Nota sobre la distribución de diferentes especies de mosquitos en Puerto Rico y en las Pequeñas Antillas), A. A. WEATHERSBEE (*Puerto Rico Jour. Pub. Health and Trop. Med., 19 (1944), No. 4, pp. 643–645; Span., pp. 646–648*).

Anopheles (Shannoniezia) costalimai Fonseca e Ramos, 1940, novo nome, e a redescrição da espécie (Diptera: Culicidae), J. O. COUTINHO (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 425–434, illus. 8; Eng. abs., pp. 433–434*).—The author redescribes *A. limai* under the new name *A. costalimai,* the older name being preoccupied.

Observations on the nocturnal activity of Anopheles and certain other mosquitoes in eastern Puerto Rico (Actividad nocturna de los mosquitos anofeles y otras especies en la región oriental de Puerto Rico), A. A. WEATHERSBEE and G. E. BOHART (*Puerto Rico Jour. Pub. Health and Trop. Med., 19 (1944), No. 4, pp. 626–634, illus. 1; Span., pp. 635–642*).—Under the conditions of test and based on entry of *A. albimanus* Wied. into horse-baited traps, this species was found more active during the middle hours of night than during either earlier or later hours. It also appeared that the number entering the traps per unit of time is not ordinarily governed by conditions of rainfall, wind, or temperature; the hours of greatest activity were those least subject to the influence of sunlight. *A. grabhamii* Theob. entered the traps during all hours of the night, though the numbers recorded did not indicate a pronouncedly hourly peak of activity. *A. vestipennis* D. and K. was taken during every hour between 6 p. m. and 6 a. m., except from 4 to 5 a. m. Eleven mosquito species other than anophelines were also collected in the traps. The common mosquitoes of the area—*Culex bahamensis* D. and K., *C. nigripalpus* Theob., *C. quinquefasciatus* Say, *Aedes taeniorhynchus* (Wied.), and *Psorophora confinnis* (Lynch-Arribalzaga)—readily entered the horse-baited traps at all hours of the night.

Sabadilla, Schoenocaulon spp., with reference to its toxicity to houseflies, T. C. ALLEN, R. J. DICKE, and H. H. HARRIS. (Wis. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 400–408, illus. 3*).—Kerosene extracts of seeds of these widely distributed plants—known for some time to possess certain insecticidal properties—were found highly toxic to houseflies, the kill and knock-down comparing very favorably with other kerosene types of sprays such as pyrethrum. Considerable variation existed in the toxicity to flies of kerosene extracts of different sabadilla samples. Among 25 tested, about 30 percent proved toxic; these were the ones obtained in a powdered condition. At room temperature no samples of freshly powdered seeds were effective. By raising the temperature of the extractive, however, all inactive samples became potentially toxic. Temperatures above 75° C. caused the initial increase in toxicity, the optimum being 150°. Application of heat to the powdered seed and its treatment with soda ash prior to extraction also considerably increased the toxicity of inactive samples; the combination of soda ash and reduced heat treatments during extraction was effective. The toxicity of the powdered seed increased with age during storage. Kerosene extracts of the seed retained their toxicity in brown glass containers for 2 yr.; extracts exposed to light deteriorated rapidly. Seeds of *S. drummondii* and *S. texanum*—both indigenous to the United States—were found to possess properties highly toxic to houseflies and comparable to species of more tropical zones. No toxicity was found in the roots, bulbs, leaves, or stems of sabadilla plants. It is concluded that kerosene extract of sabadilla seed is most promising for destroying houseflies. Under some conditions, however, its use may be limited because of its tendency to cause sneezing on inhalation.

Destruction of lice in clothing by hot and cold air, J. R. BUSVINE (*Bul. Ent. Res., 35 (1944), No. 2, pp. 115-125, illus. 4*).—This paper describes investigations conducted with an eye to very different situations, viz, the heat treatment of bedding in air raid shelters and the possible use of winter cold. The findings detailed indicated that the disinfector is capable of satisfactory results with bedding at 20-min. exposure to an air temperature of 220° F. or over, provided that no great thickness of material protects the vermin. To prevent this, mattresses must be hung so that their entire surface is exposed to the circulating hot air and blankets so that no more than two thicknesses are together. As a general conclusion from the tests with cold air, satisfactory delousing of all types of garments (at least from adult lice) can be attained by exposures overnight to a temperature of —15° or lower.

Fumigation as a method of controlling the body louse Pediculus humanus corporis De Geer.—III, Practical tests, W. A. L. DAVID (*Bul. Ent. Res., 35 (1944), No. 2, pp. 101–112, illus. 3*).—In this installment (see above) the conditions under which complete control of body lice and their eggs may be obtained were studied, and the relative uses of the methods and fumigants tried are described. Four of the materials tested—methyl formate, ethyl formate, ethylene dichloride, and methyl-allyl chloride—proved comparatively safe and pleasant to handle, but they sometimes demand rather heavy doses or long exposures, especially at temperatures below 20° C. On the other hand, chloropicrin and trichloroacetonitrile have strongly irritating properties, but their toxicity to lice is much greater. The methods described have the advantage that some are very safe and all are simple, demanding no elaborate technic or apparatus.

Blackflies found feeding on turkeys in Virginia (Simulium nigroparvum Twinn and Simulium slossonae Dyar and Shannon), G. W. UNDERHILL (*Virginia Sta. Tech. Bul. 94 (1944), pp. 32, illus. 15*).—This publication includes a detailed description of *S. nigroparvum* and *S. slossonae.* The former was found in 28 counties and 37 streams in Virginia and, although occurring as far east as Richmond, was most abundant in the mountain and foothill region. Streams 25 to 30 ft. or more wide and 15 to 24 in. deep with a flow of 4 to 6 ft. per second and a flat rocky bottom with vegetation among the rocks proved favorable breeding quarters for this species. Three generations probably occur annually. The adults of this species fed principally on turkeys.

S. slossonae was collected only in the Coastal Plain region and usually along or just above where fresh and brackish water came together. Small streams 3 to 10 ft. wide and 8 to 15 in. deep with sandy-mud bottoms, a current of 1.5 to 2 ft. per second, and considerable plant growth and shade provided a favorable breeding habitat for this species.

Limited observations indicate that the general behavior and feeding habits of *S. slossonae* and *S. nigroparvum* are similar. The text is supplemented by numerous excellent illustrations.

Notes on Oklahoma bot flies, G. W. EDDY and K. C. EMERSON. (Okla. A. and M. Col.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 2, pp. 78–79*).

The fleas (Siphonaptera) of Alberta, with a list of the known vectors of sylvatic plague, J. H. BROWN (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 207–213*).—Annotated lists are presented of the fleas of Alberta and of the hosts from which plague vectors have been recovered.

Biology of the cattle biting louse and notes on cattle sucking lice, J. G. MATTHYSSE. (Cornell Univ.). (*Jour. Econ. Ent., 37 (1944), No. 3, pp. 436–442, illus. 4*).—The incubation period for *Linognathus vituli* (L.) and *Solenopotes capillatus* Enderlein under winter barn conditions on dairy heifers averaged 11 days; that of the short-nosed cattle louse, 13 days. The oviposition rate of the last and *S. capillatus* was 1–2 eggs per day; for *L. vituli,* 1 per day. Reared under controlled conditions, the optimum temperature for the cattle biting-louse appeared to be 95° F.; the optimum relative humidity, 75–84 percent. The probable cycle of this louse on the host in winter was apparently for the egg 8 days; first instar 7 days, second 5.5, and third instar 6 days; preoviposition period 3 days; complete cycle 29 days; and oviposition rate 1 egg per 35 hr. per ♀. Normal reproduction is by parthenogenesis; this louse was maintained through two generations with no ♂♂ introduced or produced. In natural infestation, ♂♂ are present in small numbers but are most numerous in rapidly decreasing populations; thus they probably serve some function in the biology of the species. A temperature of 100° proved too high for maintenance of populations, and 125° was fatal within 1 hr. Since the normal skin temperature of heifers in summer in northern areas approaches 100° and the action of direct sunlight raises the skin temperature to over 125° in 2 min., it would appear that the winter areas of infestation on heifers are unsuited to maintenance of populations of the cattle biting-louse. Skin temperature is highly important in influencing the relative abundance of cattle lice in both winter and summer in northern areas, but this is not meant to imply that humidity, light, diet, and skin condition are not factors.

Methods for collecting ticks for study and delineation, E. T. BOARDMAN. (Univ. Fla. et al.). (*Jour. Parasitol., 30 (1944), No. 2, pp. 57–59*).—Methods are described for collecting ticks from soil, vegetation, and host animals. It is important for diagnostic purposes that ticks be killed in an expanded condition; a solution of 3 parts ether and 97 parts 20 percent ethyl alcohol was found to kill them with appendages expanded and also proved useful in killing many different arthropods—both aquatic and terrestrial. Preferably ticks and other arthropods should be transferred to a solution of 1 part glycerine and 9 parts 75 percent alcohol for final storage; the more highly chitinized species, however, may be dried. An outline of a modification of Bethe's method for staining chitin is suggested for studies of small clear chitinized structures.

The genus Amblyomma (Ixodidae) in the United States, R. A. COOLEY and G. M. KOHLS (*Jour. Parasitol., 30 (1944), No. 2, pp. 77–111, illus. 12*).—Publication of a review (61 references) of this genus of ticks in the United States was undertaken because of the increasing interest in its members as known or suspected carriers of diseases and especially because of the need of criteria for the specific identification of the larvae and nymphs. The present paper is based largely on miscellaneous collections made by members of the staff of the Rocky Mountain Laboratory, National Institute of Health. Preceding the consideration of individual species—to which there are keys to females and males and which include new taxonomy—there is a discussion of the medical and veterinary importance of the genus in the United States and a glossary of technical terms used.

Biology of Ixodes muris Bishopp and Smith (Ixodidae), C. N. SMITH. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 2, pp. 221–234*).—The hosts of this tick here reported are the jumping mouse, meadow mouse, white-footed mouse, Norway rat, short-tailed shrew, and muskrat. The localities from which collections were made were Cape Cod and the islands of Martha's Vineyard and Nantucket. The biology of *I. muris* is said to have been unknown at the time this study was started; there have been no subsequent publications on the species since its description in 1937.

Ticks and other parasites attacking northern cliff swallows, W. J. BAERG. (Univ. Ark.). (*Auk, 61 (1944), No. 3, pp. 413–414, illus. 1*).—During the 12 yr. this Arkansas colony of *Petrochelidon albifrons albifrons* has been visited, the most important parasite has appeared to be the tick *Ixodes baergi* Cooley, which is discussed in some detail. Other parasites encountered include the swallow bug, fleas (*Ceratophyllus celsus* Jord.), and bird lice (*Myrsidea dissimilis* (Kell.)).

Testing insecticides on the argasid tick Ornithodorus moubata Murray, G. G. ROBINSON (*Bul. Ent. Res., 35 (1944), No. 2, pp. 95–99*).—Sprays containing pyrethrum proved outstanding in toxicity to this tick and are recommended for use where spraying measures are employed until better substances are discovered or made available. Of the dusts, pyrethrum powder was outstanding in activity, but samples to be used should have prior tests of toxicity. Since pyrethrum powder is likely to deteriorate rather rapidly in the field, other dusts were also tried. Certain derivatives of phenol and naphthalene proved active as fumigants. Although these substances evaporated quickly in contact with the general atmosphere, they might have some use as soil fumigants in the floors of huts. Other derivatives acted purely as contact poisons and yet were just too volatile to be lasting in the general atmosphere. Alpha-naphthylamine and 3-methyl.6-ethyl.phenol are examples; the latter is more toxic, and possibly the substitution of a higher alcohol for the methyl or ethyl group might decrease the volatility but not the toxicity.

Four new species of Tydeidae from Mexico (Acarina), E. W. BAKER. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 6, pp. 159–162, illus. 9*).—Three species of *Tridilatydeus* and one of *Microtydeus* are described.

Pronecupulatus, a new genus of Tydeidae (Acarina) from Mexico, E. W. BAKER. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 2, pp. 72–73, illus. 2*).—*P. anahuacensis* n. gen. and sp. is described; this mite was found on tree-inhabiting lichens.

The Nosema problem, E. F. PHILLIPS (*Gleanings Bee Cult., 72 (1944), No. 7 pp. 316–319*).—A brief historical review and discussion of the status of this protozoan disease of bees, with the conclusion that the evidence so far presented fails to demonstrate the seriousness of *N. apis* as a cause of disease.

ANIMAL PRODUCTION

The nutritive value of corn oil meal and feather protein, C. I. DRAPER (*Iowa Sta. Res. Bul. 326 (1944), pp. 161–184, illus. 4*).—A basal cereal diet believed to be complete in required nutrients except quantity of protein, which was 8 percent, produced a slow rate of growth in chicks and rats but no other evidence of deficiency. Corn oil meal, feather protein in various combinations, and other high-nitrogen feeds were added to evaluate the nutritive properties of these feeds. Gain in weight and feed efficiency were used to measure the nutritive values of the various rations.

In one experiment with 3 lots of 15 chicks each fed in duplicate with ground yellow corn, the small quantities of meat meal, fish meal, soybean meal, and dry skim milk of the basal ration were replaced by about 45 percent of corn oil meal with and without riboflavin. Both chicks and rats fed unsupplemented corn oil meal rations grew at a slower rate than controls. The chicks on the control rations gained an average of 516 gm. as compared with 81 and 92 gm. with corn oil meal and corn oil meal with riboflavin, respectively. Rats on these rations gained an average of 195, 100, and 109 gm., respectively. The average gains of lots of 15 chicks fed in duplicate were with 16 percent protein from the standard mixture 630 gm., 16 from corn oil meal 235 gm., 15 from the standard mixture 590 gm., 15 from corn oil meal 317 gm., 13 from the standard mixture 453 gm., 13 from corn oil meal 314 gm., 11 from the standard mixture 424 gm., 11 from corn oil meal 270 gm., and with 8 percent protein from cereals 145 gm. As corn oil meal was suspected to be deficient in certain amino acids, the rations of certain chicks were supplemented with them. The addition of cystine and lysine to a corn oil meal ration produced a rate of growth significantly greater than the unsupplemented ration. Additions of glycine and glutamic acid produced gains just below the point of significance. The gain was not increased significantly with histidine, tryptophan, and arginine added to the corn oil meal ration.

In eight paired experiments with 1- to 3-week-old cockerels, a variance analysis showed a highly significant difference in the rate of body gain over a 13-day period when the corn oil meal ration was supplemented with cystine, a significant difference when lysine and glutamic acid were added, and no significant difference when glycine was added. In studies of the supplemental value of five different protein feeds for corn oil meal with lots of 20 chicks fed in duplicate pilchard fish meal as 5 percent and corn oil meal as 19 percent produced gains of 1.57 gm. per gram of protein consumed. Dry skim milk and gelatin, 9 and 3.5 percent, respectively. with 22 percent corn oil meal produced gains of 1.27 and 1.48 gm. per gram of protein consumed. Cottonseed meal and blood meal proved to be of little value, and the birds receiving them suffered high mortality. In another experiment in which lots of day-old chicks were fed proteins from yeast and corn oil meal in different proportions and growth after 2 weeks was compared by methods of Heiman, Carver, and Cook (E. S. R., 82, p. 377), lots receiving yeast as the sole protein supplement utilized feed most efficiently, but a covariance test revealed that after the gains were adjusted to a common feed intake basis they did not differ significantly. In three further trials with 10 chicks per lot at 15 and 16 percent protein levels there were greater gains and more feed consumed on mixtures of sodium sulfide-treated feathers and corn oil meal than on either alone, and the mortality was generally reduced. However, in one experiment the feathers treated with sulfide proved toxic. Autoclaving for 2, 4, 6, and 8 hr. seemed to have little or no beneficial effect on the sulfide-treated feathers fed to lots of 20 chicks. Similar results were shown with chicks and rats on the supplemental value of the sulfide-treated feathers to corn oil meal.

The composition and nutritive value of seeds hays, W. S. FERGUSON and S. J. WATSON (*Jour. Agr. Sci. [England], 34 (1944), No. 2, pp. 88–92*).—The crude protein content of 108 samples of first-year seedings of hay varied from 5 to 13.5 percent, averaging 9 percent. Hay cut in the second and third year showed that the protein content falls and the crude fiber rises with increasing age. In twenty-first-year hays the starch equivalent values were high and moderately constant, averaging 36.8, with protein equivalent values averaging 5.1 percent. Other samples of hays were also investigated for composition and digestibility.

Effect of air temperature on the rate of energy metabolism in the English sparrow, S. C. KENDEIGH. (Univ. Ill.). (*Jour. Expt. Zool., 96 (1944), No. 1, pp. 1–16, illus. 3*).—A straight-line relationship was found between the air temperature and the standard metabolism between 37° and 40° C. following the formula:

$$\text{cal./gm./hr.} = 0.558\ (37 - t) + 19,$$

wherein t refers to the air temperature in centigrade degrees, small calories are used, and gm. is the average weight during the experiment. Normal body temperatures are maintained until metabolic fatigue sets in. With rises of air temperature above 37° (98.6° F.), hyperthermia occurs which may lead to death. Water vaporization increased with temperature, and accounted for 9.2 percent of the heat loss at 5°, 16 at 25°, 31 at 35°, and 47 percent of the heat lost at 43°. The rate of breathing was 56 per minute at 30°, but rose to 200 per minute at an extremely high temperature. An average respiratory quotient of 0.73 was secured from the English sparrows caught in the wild. It was evident that these small birds reached the postabsorptive state within the 1½ to 3 hr. employed after the cessation of feeding.

Digestion in the ruminant, R. A. MCANALLY and A. T. PHILLIPSON (*Biol. Rev. Cambridge Phil. Soc., 19 (1944), No. 2, pp. 41–54, illus. 2*).—The ability of the rumen to digest large quantities of cellulose and carbohydrates, mainly through the action of bacteria but also of enzymes, is noted, and the passage of food, fermentation, and regurgitation are described. An extensive list of references is included.

The effect of diet on the vitamin A content of the bovine fetal liver, W. BRAUN and B. N. CARLE. (Univ. Calif. coop. U. S. D. A.). (*Jour. Nutr., 26 (1943), No. 6, pp. 549–554*).—The vitamin A content of the liver of aborted fetuses, though low, was in direct relationship to the amount of vitamin A in the dams' rations. Pregnant cows in an abortion experiment were separated into groups, with seven barn-fed a low vitamin A ration, five barn-fed with 400,000 International Units of shark-liver oil twice a week, four pasture-fed, and five pasture-fed with shark-liver oil. The vitamin A content of the livers of 20 fetuses aborted by cows receiving these rations averaged 1.7, 14.1, 6.6, and 10.7 I. U. per gram, respectively. The vitamin A content of selected dams' livers ascertained from samples removed by partial hepatectomy was in accord with the vitamin A in the ration.

Forest grazing in relation to beef cattle production in Louisiana, R. S. CAMPBELL and R. R. RHODES. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 380 (1944), pp. 43, illus. 11*).—Results of a survey of 118 cattle-producing farms during October, November, and December, 1943, in 34 of the 64 parishes in different parts of the State, showed that forest ranges accounted for 69 percent of the grazing over the State as a whole. Of the operators interviewed, 64 percent used free range. There appeared to be an increase in fenced control of ranges, mainly by landowners but also through nominal leasing arrangements between timber companies and local resident farmers. Forest ranges furnished little real forage during the midsummer dry period and the winter when farm pastures furnished an increasing amount of forage, and large additional acreages are needed. Calves were finished off by field crops after harvesting, mainly on corn and hay fields. Supplemental concentrates such as cottonseed meal and hulls were fed during the worst winter months for subsistence purposes. Only 29 percent of the cattlemen furnished mineral supplements to prevent mineral deficiencies. It was a common practice in certain of the Florida Parishes for dairy herds to graze on forest ranges. Herd improvement was being practiced by about 90 percent of the farmers interviewed, but the majority took up the practice within the last decade, particularly since the State was freed from cattle fever ticks. It was concluded that more and better distribution of bulls would aid in a worth-while increase in calf crop. Death losses were rather high and were due to such causes as starvation, railroad and highway accidents, bogging and drowning, disease, poison plants, parasites, and theft. Better facilities and handling practices such as good, clean water, shleter against summer heat and winter cold, boundary and cross fences, corrals, and feeding equipment were being employed. Most farmers interviewed opposed uncontrolled burning of forest ranges, but in the longleaf pines benefits for grazing and helpful forest management resulted. There was little damage done to pine seedlings by cattle on moderately stocked ranges, but hardwood seedlings were damaged by these cattle, especially during spring. Average small farm wood lots were so far below possible forest production because of excessive use for summer shade and winter protection that they furnished little or no forage. The most important forest range problems were wintering the cattle-breeding herds—supplemental feeds and improved pastures; improved forest grazing management—season of use and grazing capacity; disease control; improved-quality animals; and land control. Important needs stressed were fire protection, forest management, more land, and better land control. Suggestions are presented, from experiences of farmers, for improved forest range management.

Summer gains of yearling Hereford steers on native and cultivated pastures, G. A. ROGLER. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, pp. 20–27*).—Continuing the grazing studies of Sarvis (E. S. R., 87, p. 699), higher gains were produced on the steers on the pastures providing different amounts of grazing in the 3 yr. 1941–43 than for the 1936–40 period, this being a result of favorable weather conditions. An average rate of 5.5 acres per yearling steer from approximately May 16 to October 15 produced near maximum gains without injury to the grazing, and sufficient forage carry-over remained at the end of most grazing seasons. In 1942, 90 lb. per head difference in gain per season was shown in favor of cultivated crested wheatgrass and native grass grazing over straight crested wheatgrass. On the crested wheatgrass from May 15 to July 15 there were grazed 1.5 acres per head with native pasture the rest of the season. No great advantage was shown for rotation grazing of crested wheatgrass in 1 year's trial. Steers did not make good gains on mature crested wheatgrass, and therefore native grass must be provided from the last of June or early July to the end of the season if maximum gains are to be made. Russian wild-rye has the ability to recover rapidly after defoliation if sufficient moisture is available. The extremely high gain of 327.5 lb. per head was made on Russian wild-rye.

Comparison of native grasses and crested wheatgrass and of supplements for beef cattle in the northern Great Plains, W. H. BLACK and V. I. CLARK (*U. S. Dept. Agr. Cir. 705 (1944), pp. 11, illus. 3*).—Crested wheatgrass was more palatable and slightly more efficient than native grass (predominantly western wheatgrass, buffalo grass, and blue grama) when fed to beef cattle at the Ardmore Field Station, Ardmore, S. Dak. On the average for two winter seasons of 140 days each, a ration of about 17 lb. of these hays produced 34.5 lb. of gain per head for yearlings and 2-year-olds. The relative costs of these hays, therefore, could well be the governing factor in the choice between them. Similar summer gains were produced on 2-year-old cattle when grazed on crested wheatgrass and native grasses at rates of stocking which afforded cattle the opportunity to get their fill without difficulty. When grazed at the rate of 3 acres per head, crested wheatgrass produced 65 lb. of gain per acre as compared with 24 lb. made by steers grazing the native range at the rate of 9 acres per head. Cottonseed cake and beet pulp-molasses pellets appeared to be of about equal value when fed as supplements to the native range for wintering yearlings and 2-year-old steers. When wintered in dry lot on a ration of 15 to 20 lb. of these hays, the cattle made greater winter gains than those wintered on the range with a daily supplement of 1 lb. of concentrate. The differences in combined winter and summer gains between the two systems were not significant. The study was conducted with four lots of cattle consisting of seven steers and three spayed heifers each, fed from December 12, 1940, to May 1, 1942, with two lots wintered in dry lot and two on range.

Gains made by cattle on summer range in northern Utah, L. A. Stoddart (*Utah Sta. Bul. 314 (1944), pp. 24+, illus. 6*).—Continuing the study of Utah range plants (E. S. R., 89, p. 410), the average summer gain of Utah steers (and 14 heifers in 1943) was found to be 29.03 percent of the initial weight, which ranged from 300 to 800 lb., averaging 576.8 lb. in the 8 yr. 1934–37 and 1940–43. The cattle gains from month to month and year to year varied but averaged 1.57 lb. per head per day over the entire period. Poor gains may result from unfavorable weather conditions and the cessation of normal grazing activity. The size of the steers influenced gains; the large steers, usually older, gained significantly less in the late summer than smaller animals, but pounds gained per head over the season did not differ significantly. The smaller animals were considered more efficient in converting forage to meat than the larger animals. The most economical marketing practice depends on the condition of the cattle and range and the market trends. Dairy-breed heifers and steers were found to gain much less efficiently than Herefords. Because of the high P content of the forage and because gains did not increase with P supplement, additions of P to the ration did not seem necessary despite rather low P levels of the grasses in late summer.

Growth of steers on seleniferous range, A. L. Moxon, M. A. Rhian, H. D. Anderson, and O. E. Olson. (*S. Dak. Expt. Sta.*). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 299–309, illus. 2*).—Four lots of 10 steers each were established on a highly seleniferous range to study the effects of undergrazed range, overgrazed range, and of normal range with and without arsenic added to the salt mixture at the rate of 5, 10, and 25 p. p. m. The steers, about 1 yr. of age, were half from seleniferous and half from nonseleniferous areas and averaged about 475 lb. at the start. All four lots made good summer gains, averaging 96, 109, 97, and 109 lb., respectively, from June 21 to September 21, 1939, with 100, 300, and 200 acres of range with and without arsenic in the salt mixture. All steers remained more or less stationary in the winter, making little gains. The average gains in the second year from May 21 to August 21 were, respecitvely, 222, 235, 254, and 248 lb. The best gains were made by the steers receiving 25 p. p. m. of arsenic in the salt. Any symptoms of selenium poisoning were reduced, although symptoms of this appeared each summer or fall about the time the grass began to dry up. Lameness and cracked hoofs were prevalent in all the lots, but did not appear after arsenic in the salt was increased from 10 to 25 p. p. m. The selenium content of the tissues and organs was ascertained at the time of slaughter.

Carcasses of cattle in feeding experiments show low grain ration made good beef, W. E. Connell and R. C. Tom (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 4. pp. 6–9, Illus. 1*).—Good to Choice beef was produced by feeding steers only a small amount of grain with Colorado roughages and alfalfa hay but no protein supplement. The most economical gains were made by steers receiving a small amount of grain plus beet byproducts, as reported for the previous year's results (E. S. R., 90, p. 237). The studies were conducted with 8 lots of about 9 steers each, fed for 140 days on rations of rolled barley alone or with equal parts of ground corn and alfalfa hay. The different lots received for comparison wet beet pulp, alfalfa silage, beet top silage, corn silage, or dried beet tops. The carcasses all graded Good or Choice.

Cull peas for fattening calves, H. G. McDonald and M. E. Ensminger (*Washington Sta. Bul. 439 (1944), pp. 16, illus. 4*).—A mixture of peas, barley, and oats, of which 20–40 percent consisted of cull peas, proved approximately equal to a mixture of 80 percent barley and 20 percent oats for the promotion of gain in baby beef steers in about 150 days. In one of the three experiments wheat hay was compared with first-year sweetclover hay as a roughage, but first-year sweetclover was employed in the other two experiments in which varying percentages of barley and peas were fed with 20 percent oats. The average daily gain on all rations was slightly better than 2 lb. No digestive disturbances or bloat occurred when 20–40 percent of cull peas was included in the grain mixtures fed with chopped first-year sweetclover, but when more than 40 percent peas was included bloat hazard was serious. Wheat hay plus grain was not as satisfactory for fattening calves as sweetclover hay and grain even though peas were added to the former to bring about an acceptable protein and carbohydrate balance. Wheat hay had an advantage in eliminating difficulties with bloat when grain mixtures consisting of 60–80 percent peas were fed with sweetclover.

The relationship of feeder grade, initial weight, total gain, finished grade, and carcass grade of lambs, L. E. JOHNSON (S. Dak. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 224–232, illus. 2*).—Among a total of 8,494 lambs fattened in groups of about 100 each in 11 feeding seasons on rations consisting of one or more grains, a legume hay, one or more beet byproducts, and with and without protein supplements and minerals, considerable relationship with correlation coefficients varying from 0.35 to 0.54 was shown in all lambs marketed at one time between initial weight, feeder grade, finished grade, and B. A. E. carcass grade, but packer carcass grades were only slightly related to the other measurements. Marketing the lambs as they finished by topping the lots decreased the number of very light and overweight carcasses and consequently lowered the advantages shown in greater initial weight and superior feeder grade. The use of more than one of the measures studied in predicting gain, finished grade, and carcass grade of the lambs did not seem practical, and the multiple correlations were only slightly better than the simple correlations. In general, the lambs increased about one grade during fattening. In the relationship between the initial weights, feeder grade, total gain, finished grade, B. A. E. carcass grade, and packer carcass grade, standardization of lamb carcass grade seems needed on the basis of value and for the daily purchase of live animals. The data were analyzed on the basis of correlations and regressions between the different measurements taken for groups of the lambs.

The value of vitamin D and bone-flour in the prevention of rickets in sheep in New Zealand, L. W. N. FITCH and T. K. EWER (*Austral. Vet. Jour., 20 (1944), No. 3, pp. 220–226, illus. 3*).—Three groups of nine Corriedale wethers each and three groups of four Corriedale rams were allowed green Algerian oat pasture from April 10 to about the middle of August. One group was supplied with 30 cc. cod-liver oil per head per week and a second group received 2 oz. of bone flour weekly. The third group was given no supplement. Gains in live weight and serum calcium and phosphorus are shown. The serum calcium levels of all wether groups were comparable, but the serum phosphorus of both treated groups was significantly higher in those receiving the supplements. Almost all of the control animals and those receiving bone flour developed rickets. The widths of the distal epiphyseal cartilages of the metacarpal bones were used to assess the value of vitamin D and bone flour for preventing rickets.

Market hog feeding and management, E. L. QUAIFE (*Iowa Sta. Bul. P66 (1944), pp. 177–196, illus. 8*).—General directions for the feeding and management of spring and fall pigs, with special attention to corn and soybean rations and the use of pasture.

An attempt to improve a concentrate mixture composed of yellow corn, beef meal, soybean meal, and alfalfa meal for weanling pigs in drylot, B. W. FAIRBANKS, T. A. KING, J. L. GOBBLE, J. L. KRIDER, and W. E. CARROLL. (Univ. Ill.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 250–256*).—In two experiments with 148 spring and fall pigs, the average daily gains on the basal ration were 0.94 and 0.70 lb., respectively, but with the addition of one-third hulled oats the average daily gains were 1 and 0.88 lb. With additions of dry skim milk or dried corn distillers' solubles to the basal ration, the average gains of the two trials were 0.84 and 0.83, which were very similar to those on the basal ration alone. The rations were so balanced as to consist of approximately 25 percent protein.

Large amounts of cottonseed meal for pigs (*Mississippi Sta. Rpt. 1943, p. 15*).—In experiments with 7 lots of 10 pigs each, varying combinations of cottonseed meal and minerals were tested as supplements to corn. One lot receiving equal parts of cottonseed meal and tankage as a 15-percent supplement to corn made an average daily gain of 2.16 lb. in 65 days. An average daily gain of 1.92 lb. was produced by corn and cottonseed meal 7 : 3. When cottonseed meal was treated with ferrous sulfate, the average daily gain in 73 days was 1.64 lb. On this ration, with a mineral mixture of oystershell flour, ferrous sulfate, and salt, the average daily gain was 1.73 lb. Various combinations of delta soil and alfalfa meal were fed with the cottonseed meal and corn, and the average daily gains ranged from 1.66 to 1.86 lb.

Cooked waste pinto beans found by tests to be good protein-rich feed for hogs, W. E. CONNELL (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 4, pp. 4–6*).—The average daily gain made by a lot of ten 100-lb. pigs fed for 79 days on ground corn and soybean meal was 1.22 lb. Another lot on ground corn and cooked pinto beans made the same rate of gain, whereas a third lot which received raw pinto bean meal in addition to the ground corn made an average daily gain of 0.63 lb. A fourth lot of pigs on cooked pinto beans alone gained 1.1 lb. per day. After 79 days' feeding only 2 of the pigs on corn and pinto bean meal were fat enough to market, while from 5 to 7 were marketed from each of the other lots. The carcasses from pigs on cooked beans alone were as firm after 30 hours' chilling as those from corn and soybean meal.

Further investigations of the nutritive value of swill: Starch equivalent, and seasonal variation in the composition and feeding value of concentrated swill, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci.* [*England*], *34 (1944), No. 2, pp. 110–117*).—The value for pigs of urban swill collected during the winter months when the main ingredients were potato peelings, cabbage leaves, and other vegetable residues and during the summer months when it consisted mainly of pea pods, cabbage leaves, and cabbage stalks was assessed as in previous work (E. S. R., 89, p. 350). Digestion trials revealed that the summer swill had a lower digestibility than winter swill. In winter-concentrated swill, 82 percent of the organic matter was assimilated by sheep.

Poultry for home and market, J. B. COOPER (*Atlanta, Ga.: Turner E. Smith & Co., 1944, pp. 481+, illus. 194*).—A guide to poultry production, with sections on poultry diseases and parasites, brooding chicks, the growing period, the laying flock, breeding and incubation, marketing and exhibiting poultry and eggs, and the production of capons, turkeys, ducks, pigeons, geese, and game birds.

Protein requirements of chickens at various stages of growth and development (*New Hampshire Sta. Bul. 351 (1943), pp. 49–51*).—In comparisons of growth of chicks to 10 weeks of age on 15 and 19 percent protein rations from soybean meal and corn gluten meal, the soybean rations were preferred at both protein levels, and the higher protein levels produced superior gains than the lower amounts of protein from both sources, as in previous studies with animal proteins (E. S. R., 86, p. 371).

The gains on the soybean proteins were equal to or only slightly less than those produced in previous studies with dried skim milk or fish meal. Soybean rations were more efficient than corn gluten rations. Daily records were kept of feed and water consumption and the feces produced, with analyses at the conclusion of the experiment of the contents of the alimentary tract, especially the gizzard.

The utilization of the sulfur amino acids by the chick, C. R. GRAU and H. J. ALMQUIST. (Univ. Calif.). (*Jour. Nutr., 26 (1943), No. 6, pp. 631–640, illus. 1*).—A basal ration in which the only protein source was soybean protein did not support a good rate of growth in chicks unless methionine was added. Autoclaving the soybean protein for 1 hr. at 15 lb. pressure did not improve growth. The chicks were depleted of choline for 16–21 days after hatching and divided into 23 groups of 3 or 4 each on a basal ration of soybean protein 23 percent, glucose 52.8, cellulose 5, calcium gluconate 8, cottonseed oil 5 percent, and minerals and vitamins. Supplements of *l*-cystine, *dl*-homocystine, *dl*-methionine, choline chloride, S-methylcysteine, and *l*-methionine were given separately or together to groups of chicks for 6 days, and the percent gain in weight per day was ascertained. Evidently the choline-depleted chicks could not utilize homocystine in place of methionine, but homocystine could replace cystine in the choline-depleted chicks. *dl*-Methionine was equivalent to *l*-methionine for growth, whether or not choline was present in the diet. S-methylcysteine neither assisted in the utilization of homocystine nor replaced cystine in the ration of the chick.

Methionine deficiency of Alaska field peas for chick growth, C. F. PETERSEN, C. E. LAMPMAN, D. W. BOLIN, and O. E. STAMBERG. (Idaho Expt. Sta.). (*Poultry Sci., 23 (1944), No. 4, pp. 287–293*).—Carrying forward the work of Woods et al. noted on page 140, in which Alaska field peas were found to be relatively complete for the rat in known essential amino acids except methionine, similar results were found with the chick. In three trials, weights of Single-Comb White Leghorn cockerels per lot were compared at 7, 10, 14, 18, and 21 days on 12 percent protein from peas with and without 0.5 percent methionine in the first trial. Subsequent trials were based on rations containing 6, 12, and 18 percent pea protein with and without 0.25–0.75 percent methionine. Comparisons were made of the gains produced by additions of 0.4 percent cystine alone or in addition to the methionine. In the main, the lots were fed in duplicate.

The weights at 21 days with 12 percent pea protein alone or with 0.4 percent cystine were less than 85 gm. The weights with 0.5 percent methionine were about 148 gm., with no improvement for additions of cystine. The average gain on the 18-percent pea-protein ration was 22.5 gm. as compared with 89.9 gm. on the 18 percent pea protein plus 0.5 percent methionine and 0.4 percent cystine. This gain per gram of protein consumed was practically equivalent to the 18-percent control lot. There was a more efficient utilization of the protein at the 12-percent than at the 18-percent level. With the varying amounts of methionine the proteins of peas were more efficiently utilized than the proteins of a control ration consisting of herring fish meal, meat meal, and dried milk.

Corn, wheat, and barley for chickens, W. O. WILSON (*South Dakota Sta. Bul. 376 (1944), pp. 16, illus. 6*).—In a series of experiments conducted from 1936 to 1943, corn, wheat, and barley were found to be about equal value for poultry for starting, growing, and laying rations. Measurements of carcass quality employed in previous studies (E. S. R., 84, p. 802) were primarily concerned with the fat thickness. Mashes should be fortified with vitamins and minerals, although a 20-percent protein mash with wheat has resulted in a vitamin A deficiency. Differences in egg production were not significant when tested statistically. Hens on these grains and mash were able to balance protein intake of 20–26 percent in mash to about 16.5

percent. Hens allowed to choose their own grain consumed 51 percent of the total intake as wheat, 33 percent as corn, and 16 percent as barley. A laying ration which contained no animal protein gave results comparable to those produced on a ration containing 15 percent protein. There were employed in the growing trials 3 lots of 60 Rhode Island Red cockerels each fed from 8½ to 28 weeks of age. For studying the physical measurements of fattening and fleshing fowls in 1940 and 1941, 10 Barred Plymouth Rocks and 10 Rhode Island Red hens were employed. In 10 laying trials lasting 32–48 weeks, there were 30–60 birds per lot starting at the age of 6-7 mo. with birds of various breeds, including White and Barred Plymouth Rocks, New Hampshires, Rhode Island Reds, and White Leghorns.

Digestibility trials with poultry: The digestibility of dura, carobs, and hide-fleshings, A. Bondi and H. Meyer (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 118–122*).—In digestion trials lasting 12 days with 1-year old White Leghorn cockerels, durra was found to equal corn and be better than wheat, barley, and oats in feeding value. Durra contains a large amount of easily digested starch and a small percentage of crude fiber. The protein and crude fiber of carobs were not digested to any extent, the main nutrient factor being represented by digestible sugars of the nitrogen-free extract. Hide fleshings, a byproduct of tanneries, contained 66.25 percent protein and was digested by poultry like meat-meal protein.

Dehydrated sweetpotatoes for chicks (*Mississippi Sta. Rpt. 1943, p. 28*).—Four lots of 50 hybrid (Barred Rock ♂ × White Leghorn ♀) showed that the higher the percentage of dehydrated sweetpotatoes used, especially from 17 to 32 percent, the poorer were the results. Chicks of the control lot without sweetpotatoes averaged 32.3 oz. after 2 months' feeding; with 17 percent of sweetpotatoes the average weight was 30.04 oz., with 22 percent 29.97 oz., and with 32 percent the average weight was 27.74 oz.

The value of a sod range for starting chicks, growing pullets, and laying hens, A. B. Stephenson and R. L. Bryant (*Virginia Sta. Bul. 362* (*1944*), *pp. 18, illus. 1*).—In studies, during 3 successive years, on the growth of chicks to 8 weeks of age and pullets from 8 to 20 weeks and on egg production from 20 to 68 weeks in lots of 150 or 200 Single-Comb White Leghorn chicks, comparisons were made of bare range, mixed grass pastures, and confinement to a house with or without access to a sun porch, which showed that the different methods of management did not affect growth, feed consumption, or mortality of the chicks during the starting period. Although there were variations in the results of the three trials, the lots of pullets (70 or 75 each) on range or bare ground attained greater weights at 20 weeks of age than those confined to a house or sun porch. There were no significant differences between the weights of the pullets or feed consumption on bare ground and pasture, but these groups were significantly heavier than those confined to the house with or without the sun porch. There was considerable cannibalism in the confined groups. In the laying trials there were no significant differences in the age of first egg by pullets grown under the four methods of management. The egg production in the spring was higher for pullets on range than those confined, regardless of the management during the growing period, probably because of the increased vitamin and protein consumption. During the fall and winter the confined birds laid slightly better, probably because of protection from inclement weather. There were no significant differences in production for birds differently reared except that birds reared on sun porches laid less eggs, but there was no explanation for the difference. Both fertility of the eggs and percentage of chicks hatched were higher for layers kept on range than for those confined. The use of a sod range during the growing and laying periods was found to be preferable to keeping the birds in strict confinement, but it seemed advisable to keep them confined to the house during the fall and winter months.

Studies of calcium and phosphorus metabolism in the chick, I, II, E. W. McChesney (*Jour. Nutr., 26 (1943), Nos. 1, pp. 81–94; 5, pp. 487–498*).—The effectiveness of vitamins D_2 and D_3 and dihydrotachysterol administered by different methods on the minerals in the tibia was investigated in these experiments.

I. *The comparative effect of vitamins D_2 and D_3 and dihydrotachysterol given orally and intramuscularly.*—Chicks of both sexes were divided on the sixth day of life into 18 groups of 10 chicks each and continued on a depletion ration until the seventeenth day, after which various oral or intramuscular administrations of D_2, D_3, or dihydrotachysterol in corn oil, propylene glycol, or sesame oil were provided. Chicks were sacrificed at intervals and all at the forty-fifth day and calcium and phosphorus ascertained in the tibia bone ash. In relative effectiveness on oral administration, the ratios $D_3 : D_2 = 35 : 1$ and dihydrotachysterol : $D_3 =$ about $4.5 : 1$ were confirmed. When given intramuscularly at the same dose level as D_3, D_2 had a much inferior effect and the mineral balances were low. Dihydrotachysterol was not as effective intramuscularly as orally in comparison with the effects of D_3. Doses of D_2 and D_3 administered orally maintained normal calcium and phosphorus metabolism, but dihydrotachysterol equivalent in antirachitic effect did not maintain normal serum calcium levels and the mineral retention was less. Chicks were definitely weakened by D_2 and dihydrotachysterol administered intramuscularly in oil. Vitamin D_3 given intramuscularly in propylene glycol was better utilized than orally in oil, but given intramuscularly in oil it was more poorly utilized than when given orally.

II. *Relative antirachitic effectiveness of vitamins D_2 and D_3 and dihydrotachysterol administered parenterally.*—The effectiveness of D_2, D_3, and dihydrotachysterol administered intravenously, intramuscularly, or orally to the chick in propylene glycol and corn oil were compared in lots of 10 to 12 male chicks depleted to 17 days of age. Dihydrotachysterol was 300 percent more effective by the oral route than D_3, but it was only about 20 percent more effective by the parenteral routes. D_3 was somewhat better absorbed from the digestive tract than D_2.

Studies on carotenoid metabolism.—IV, The effect of vitamin A intake on the carotenoid and vitamin A content of the eggs, liver, blood, and body fat of hens, H. J. Deuel, Jr., M. C. Hrubetz, F. H. Mattson, M. G. Morehouse, A. Richardson, et al. (*Jour. Nutr., 26 (1943), No. 6, pp. 673–685, illus. 2*).—Continuing this series (E. S. R., 90, p. 676), large amounts of vitamin A in a ration of hens receiving carotenoids caused a progressive suppression in the pigment content of the egg yolk. The lowering was significant on a ration in which 15,000 International Units of vitamin A were included per pound, and it decreased to only 25 percent of the basal level of chickens receiving 200,000 I. U. of vitamin A per pound of feed. A similar effect was noted in the vitamin A content of the blood and liver, but some exception was found in the body fat, due, it is assumed, to the sluggish turn-over of the carotenoids. "The vitamin A in the yolk was unchanged from the average control level of 46.8 I. U. per gram when 1,000, 2,000, or 15,000 I. U. of this vitamin were added per pound of food. With higher doses of vitamin A in the diet, significantly increased levels were found in the yolks, the values, respectively, being the following: 30,000 I. U. group, 54.6; 60,000 I. U. group, 62.3; 100,000 I. U. group, 99.3 I. U.; and with the 200,000 I. U. group, 120.7 I. U."

The use of crystalline riboflavin in poultry rations, G. F. Heuser (*Nutley 10, N. J.: Hoffman-La Roche, [1944], pp. 18*).—A general review of the need of poultry for riboflavin and its availability in feeds and in a synthetic crystalline form. An extensive bibliography is included.

The comparative toxicity of calciferol, A. T. 10, and cod liver oil concentrate for chicks, J. T. CORRELL and E. C. WISE (*Jour. Nutr., 26 (1943), No. 6, pp. 641–648*).—Normal mineral responses in the chick were affected by daily doses of 3 International Units (11.1 mg.) of vitamin D from cod-liver oil, 100 I. U. (2.5 µg.) from calciferol, and 0.5 I. U. (16.6 µg.) from A. T. 10 (dihydrotachysterol). Study was made with 20 chicks per lot on these substances, furnishing per day, respectively, 1–25,000, 10–125,000, and 0.25–7.5 I. U. of vitamin D. Toxic symptoms were noted at about 5,000, 1,000, and 10 times the minimal dose, respectively. There was no increase in serum phosphatase even with massive doses of A. T. 10. Thus, this sterol preparation resembled both vitamin D and parathyroid hormone.

The cause and prevention of gizzard lesions in chickens (*New Hampshire Sta. Bul. 351 (1943), pp. 51–52*).—The occurrence of high and low amounts of gizzard erosion in chicks in the third generation followed the general trend of the previous generation. In third-generation chicks the gizzard score of 173 chicks from the high group was 1.57, and of 168 chicks from the low group 0.78, declining from a previous average of 0.91 in the second generation.

There was evidence that cod-liver oil increased the occurrence of gizzard erosion. The preventive action of cholic acid was confirmed.

The effect of different intake levels of alfalfa leaf meal in enhancing hatchability, C. P. HART and H. O. STUART (*Rhode Island Sta. Misc. Pub. 20 (1944), pp. 6+*).—Lots of 45 Rhode Island Red hens each received 0, 5, 10, 15, and 20 percent alfalfa meal in addition to a basal ration, which was presumed to be complete, for a study of effects on egg production and hatchability of fertile eggs. The percentage protein was balanced with meat scrap to approximately 18.5 percent. The results were similar except that egg production, hatchability, and feed required per dozen eggs were lower in the lot receiving 20 percent of alfalfa leaf meal. Yolk color became darker with increased amounts of alfalfa meal, but hatchability was not related to color of the yolk.

Effects of temperature and humidity on the keeping quality of shell eggs, E. M. FUNK (*Missouri Sta. Res. Bul. 382 (1944), pp. 27, illus. 15*).—Carrying further quality studies in shell eggs (E. S. R., 89, p. 583), investigations were made of fertile and infertile eggs stored at 30°, 50°, 70°, 80°, 90°, and 100° F. and relative humidities of 30–45, 60–75, and 85–93 percent. The conversion of thick albumen to thin albumen was very rapid at temperatures above 80° in both fertile and infertile eggs. It was about as much in 3 days in fertile eggs as after 13 days in infertile eggs held at 100°, but at 30° and 50° there was no difference between them. The yolks of fertile and infertile eggs stored at the higher temperatures tended to flatten rapidly, but there was little difference between them at the lower temperatures. The vitelline membrane of the yolk retained its strength remarkably well at 30° and 50°, but deteriorated rapidly at higher temperatures. In fertile eggs the diameter of the blastoderm increased rapidly above 85°. Temperature of storage was important in the preservation, cooking, and edible qualities of fertile eggs, which became inedible in a short time at 90°–100°. Humidity was largely responsible for evaporation, but it had little influence on the quality of the albumen or yolk.

Growing turkeys on rations low in animal protein, A. W. BRANT, C. I. DRAPER, and R. J. EVANS (*Washington Sta. Bul. 441 (1944), pp. 12, illus. 3*).—Sources of animal and plant proteins were compared for turkeys from hatching to 28 weeks of age. The proteins fed for comparison were (1) meat scrap and soybean meal, (2) herring fish meal and soybean meal, (3) herring fish meal, soybean meal, and cottonseed meal, and (4) a control protein of herring fish meal and soybean meal. The starting rations furnished about 22–23 percent protein up to 8 weeks of age, which were changed to developing mashes of about 20 percent protein fed to 28 weeks of age. Body weights and feed consumption were recorded at 2- or 4-week intervals. There was no significant difference in the pounds of feed required to produce a pound of gain to 28 weeks of age, nor in the body weights or efficiency of gain produced by the four proteins which were fed in triplicate with 16 or 17 poults in each lot. A ration in which half the supplementary vegetable protein was from cottonseed meal produced gains as satisfactorily as any of the other proteins. About 5.5 lb. of feed were required per pound of gain.

Turkey egg hatchability in South Dakota, F. R. SAMPSON and W. O. WILSON (*South Dakota Sta. Bul. 375 (1944), pp. 24, illus. 11*).—In studies of the effects of various conditions on the hatchability of turkey eggs, it was found that the hatchability was less and the percentage of cripples greater in eggs held from 7 to 14 days than in eggs held less than 7 days. The fertility and hatchability of eggs from Beltsville Small Whites surpassed those from Broad Breasted Bronze turkeys in 1942 and 1943. Breeders allowed to range with shelter at will had higher fertility but produced less poults per bird during the hatching season than restricted hens. There was no advantage from feeding alfalfa silage or 10 percent liver meal as compared with 10 percent fish meal. Soybean meal up to 25 percent of the total ingredients and amber cane as a mash ingredient and scratch grain proved satisfactory. Fertile eggs lost 3.86 percent less moisture than infertile eggs during the first 24 hr. of incubation. The inherent reproductive ability of the individual hen appeared to be an important factor in a study of conditions affecting fertility and hatchability. In the course of the investigational work 35 to 150 hens were maintained each year. A total of 4,559 eggs were incubated, with different temperatures and air movements.

Body weights and organ measurements in relation to age and season in ring-necked pheasants, C. M. KIRKPATRICK. (Ind. Expt. Sta.). (*Anat. Rec., 89 (1944), No. 2, pp. 175–194, illus. 16*).—Growth curves are presented for live weights and measurements taken at approximately 5-week intervals on pheasants raised under artificial conditions. Measurements and weights are reported on the glands and organs of 177 birds of both sexes. The period of most rapid growth was 42 to 138 days.

DAIRY FARMING—DAIRYING

Stephen Moulton Babcock—scholar, scientist, example, H. H. SOMMER. (Univ. Wis.). (*N. Y. State Assoc. Milk Sanit., Ann. Conf., 21 [1943], pp. 77–80, 82, 84*).—An account is given of the life, work, and career of Dr. Babcock and the development of the Babcock test, including his accomplishments and those of related workers in the general fields of chemistry and animal nutrition, especially Drs. G. C. Caldwell, H. P. Armsby, W. A. Henry, and F. W. Woll.

[Nutrition studies with young dairy cattle at the New Hampshire Station] (*New Hampshire Sta. Bul. 351 (1943), pp. 17–18, 59*).—In studies on dry rations for raising dairy calves and heifers, three different dry calf rations were fed to 19 calves, with a minimum of fluid milk. As good results were obtained with a ration containing fish meal and dried whey as with a ration with 25 percent powdered skim milk. Beneficial results were obtained by adding ¼ lb. dried whey daily to the milk of calves with diarrhea. Analyses of calves' blood for calcium, inorganic phosphorus, and glucose did not show a significant relation to the kind of ration fed, although different mineral supplements were provided in some cases.

In another experiment on the effect of vitamin A on the utilization of energy and protein by calves, a higher percentage utilization of feed was obtained by calves receiving optimum amounts of cod-liver oil than by a calf with one-twentieth of the optimum vitamin A. The basal metabolism on the deficient ration was nearly 15 percent higher than that of other calves. The deficient calf went totally blind during the fifth month, and the sight was not restored by high dosages of cod-liver oil. Blood analysis showed a low content of calcium when the deficient vitamin A ration was provided.

Carotene requirements for the maintenance of a normal spinal fluid pressure in dairy calves, L. A. MOORE, M. H. BERRY, and J. F. SYKES. (Md. and Mich. Expt. Stas.). (*Jour. Nutr., 26 (1943), No. 6, pp. 649-658*).—Fifteen calves at 3 mo. of age were placed for 30 days on a basal ration low in carotene for depletion, after which varying amounts of carotene were added in dehydrated alfalfa leaf meal. The calves were weighed at about 1-week or 10-day intervals over 1 yr. Measurements of vitamin A, carotene, and ascorbic acid in the blood plasma and of the spinal fluid pressures were ascertained by methods previously described by Sykes and Moore (E. S. R., 88, p. 680). The results showed that an intake of 62 µg. of carotene per kilogram live weight was not sufficient to prevent an increase in the spinal fluid pressure, but this pressure was normal for animals receiving 66–68 µg. of carotene per kilogram live weight. Determinations of plasma vitamin A values were not so critical as the spinal fluid pressure as a measure of carotene requirements.

Protein supplements in dry calf starters for calves on limited quantities of milk, G. W. TRIMBERGER and H. P. DAVIS (*Nebraska Sta. Res. Bul. 134 (1944), pp. 24*).—Supplemental protein from soybean meal, tankage, ground soybeans, dried whey and blood meal, dried skim milk powder, and blood meal alone was fed in fluid form for 30 days and added to the dried calf meal for 4 mo., in six groups totaling 56 calves previously fed whole milk to approximately 3 weeks of age, with reduced amounts of skim milk for 30 days. The dry calf starters were fed to 4 mo. of age, after which the same basal grain mixture was supplied to all to 6 mo. of age. The calves on proteins from the soybean meal and ground soybean rations lost weight and became very emaciated and were finally switched to animal protein rations. These calves recovered, but they had the highest requirement for total digestible protein and total digestible nutrients per 100 lb. gain, indicating the poor economy of feeding soybean meal and ground soybeans as the principal source of protein in dry calf starter rations for young calves of approximately 1 mo. of age. At 6 mo. of age the average weights and daily gains of the calves were, respectively, on rations with the principal sources of protein from tankage 349.0 and 1.40 lb., whey and blood meal 338.1 and 1.34 lb., dried skim milk 361.4 and 1.49 lb., and blood meal 352.5 and 1.44 lb. A variance analysis of differences in gains showed highly significant differences at 8 weeks of age. At 4 mo., and again at 6 mo., there were no significant differences between the gains of the four groups receiving animal protein in their rations.

A way to save milk in raising calves, N. N. ALLEN (*Vermont Sta. Pam. 11 (1944), pp. 3*).—Storing of colostrum in a frozen condition and its use as a substitute for normal milk in calf feeding is recommended. The colostrum should be frozen in amounts sufficient for 1 day's feed. If packed in sawdust on the north side of a building it will remain solid in Vermont throughout the winter.

List of sires proved in dairy herd improvement associations, 1944 (*U. S. Dept. Agr., Misc. Pub. 547 (1944), pp. 234*).—The eighth annual list (E. S. R., 89, p. 723) by breeds of the 3,101 sires proved in the dairy herd improvement program between January 1, 1943, and January 1, 1944, with average records of the daughters and their dams.

Breed analyses of herd management practices (*New Hampshire Sta. Bul. 351 (1943), pp. 16-17*).—From a study of the relationship of management practices to the milk production of more than 4,000 New Hampshire dairy herd improvement cows of different breeds, the Jerseys showed no significant relation between the calving month and production, although cows of the other 4 breeds showed lower lactation yields with midsummer freshening and higher yields with late fall and winter freshening. Holsteins showed greater response in milk yield to longer lactation than other breeds. Ayrshires, Guernseys, and Holsteins showed a positive correlation between increased production and a widening ratio of milk to concentrates, whereas Jerseys showed a negative correlation. "Greatest returns of milk in relation to amount of grain used, tabulated on the basis of month [of] calving, were found in January and February with Ayrshires, January and March with Jerseys, and March and May with Holsteins. No significant relation was evident in the case of Guernseys and Milking Shorthorns." Dry periods longer than 90 days did not result in increased milk yield in subsequent lactations. Breeds differed in the effects of feeding during the dry period. "Correlations between the amount of grain fed during the lactation period and 4 percent F. C. M. produced were as follows: Ayrshire 0.688 ± 0.02; Guernsey 0.476 ± 0.029; Holstein 0.787 ± 0.00875; Jersey 0.689 ± 0.0249; Milking Shorthorn 0.816 ± 0.0259."

Improving the solids-not-fat content of milk by selective breeding (*New Hampshire Sta. Bul. 351 (1943), p. 18*).—Of the 13 sires proved at the station, 9 increased and 4 decreased milk production; 5 lowered and 8 increased fat percentage; and 9 increased and 4 lowered the percentage of solids-not-fat. The study further indicated that milk production, percentage of butterfat, and percentage of solids-not-fat were separately inherited.

Milk, milk, more milk and better milk, J. M. SHERMAN. (Cornell Univ.). (*Milk Plant Mo., 33 (1944), No. 8, pp. 22–25*).—Improvement of nutritional standards through the use of milk is emphasized.

Classification of the organisms important in dairy products.—IV, Bacterium linens, J. O. ALBERT, H. F. LONG, and B. W. HAMMER (*Iowa Sta. Res. Bul. 328 (1944), pp. 233–259*).—Continuing the series (E. S. R., 85, p. 102), it was found that *B. linens* is widely distributed in certain dairy products and about stables, especially in feeds, hay, straw, water, manure, mouth of cows, and the air of stables and dairy plants, but rarely is it found in soil. A special isolation technic for *B. linens* was developed which includes the use of a cheese agar and incubation of smeared plates in oxygen. The method was particularly useful in investigating the numbers and distribution of *B. linens* on and in various cheeses and milk and other materials, even when the numbers of organisms are small compared with the total bacterial content. In the isolation of the organism, consideration was given to the fact that it readily tolerated 15 percent sodium chloride in broth or skim milk, and there was evidence of growth in higher concentrations. The special medium included 5 percent sodium chloride, a high pH, or a combination of the two, and an intensification of color produced by the organism with sodium oxalate in the medium and in atmosphere of oxygen. The protein was the principal constituent of milk attacked. *B. linens* produced an alkaline reaction in litmus milk and then conspicuous proteolysis, which varied with different strains. It was not lipolytic, producing a putrid condition in butter at 21° C. Adding 10 percent peptone or 5 percent peptone and 5 percent casein to tryptone glucose extract agar increased color production. *B. linens* produced volatile acids from various alcohols in a medium consisting of 0.3 percent desiccated yeast extract in water. The products of various alcohols are indicated. *B. linens* grew at a pH of approximately 6 and 9.8 but not at approximately 5 in 2 percent peptone solution. The organism survived in litmus milk at room temperature for at least 4 mo., and when dried on filter paper it survived at least 3 mo. It was easily destroyed by heat. In certain media it produced catalase. There is given a detailed description of *B. linens* and a bibliography of 19 references.

Influence of udder cells on the routine resazurin test, the 10-minute resazurin test, and the methylene blue test, S. B. THOMAS and D. A. BOWIE (*Dairy Indus., 9 (1944), No. 5, pp. 335–338*).—The examination of 4,918 bulk milk samples over a period of 3 yr. showed that 70 percent had a cellular content below 750,000 per cubic centimeter. Cellular counts of 750,000 to 1,500,000 were observed in about 20 percent of the samples examined, which was attributed to 5 to 30 percent of the milking cows being infected with subclinical mastitis or advanced in late lactation. Heavy mastitis infections occurred in 8 percent of the samples. These had over 1,500,000 leucocytes per cubic centimeter. Milk heavily infected with mastitis or containing a high proportion of milk produced at the end of lactation (leucocytes over 1,500,000) was generally detected by the routine resazurin test, 65 percent being degraded to Category B and 10 percent to Category C. Of these samples, 25 percent reduced methylene blue within 5½ hr. Under summer conditions with routine resazurin incubations of 15 min. to 1 hr., udder cell reducing activity was at its minimum, but the bacterial activity was at its height. The resazurin test is deemed a much more sensitive index of udder cell reducing activity than the methylene blue test.

Non-chlorine materials for the germicidal treatment of dairy utensils, J. M. FRAYER (*Vermont Sta. Bul. 511 (1944), pp. 23*).—The germicidal value of five materials—Mikro-San, Roccal, Dowicide A, Oakite, and Rub-R-Kleen—for treatment of dairy utensils was ascertained by the number of organisms of *Aerobacter aerogenes, Bacterium subtilis,* and *Escherichia coli* surviving six different strengths of each of the materials for 15 sec. to 15 min. Mikro-San had a germicidal effect independent of its detergent value and of the high temperatures recommended by the manufacturer as necessary for the cleansing and sterilizing process. Roccal is a powerful, quick-acting germicide, effective in relatively high dilutions. Dowicide A is a powerful germicide which is quick-acting and effective in relatively low concentrations. It is believed that, if properly used, utensil treatment with it will not adversely affect the phosphatase test of subsequently pasteurized milk. The product proved to be unpleasantly irritating to the skin of some people, and thus might prove irritating to milkers washing udders, or the continued use might irritate the udder. Oakite was apparently not as quick-acting as Roccal or Dowicide A and, therefore, was perhaps not as useful as a rinse, but it might prove effective on longer contact. No bacteria were found on 10 minutes' exposure to even the weakest solution. Rub-R-Kleen, a convenient lye base material, had a considerable germicidal value if left in contact with the bacteria for a considerable length of time. It has slow action and an affinity for certain metals of the dairy industry, preventing its use as a rinse. On the dairy farm it should be restricted in the main to sanitization and conditioning milking machine rubber parts, for which it is well suited.

The training and employment of milk sanitarians: A committee report, H. F. JUDKINS, F. H. HERZER, L. H. BURGWALD, P. H. TRACY, C. E. WYLIE, and C. L. ROADHOUSE (*Jour. Dairy Sci., 27 (1944), No. 8, pp. 691–699*).—A committee of the American Dairy Science Association defines the milk sanitarian as one concerned with the production and sanitation of milk and its products for the public benefit. His duties are designated as those pertaining to the production of dairy products under sanitary conditions. A knowledge of dairying, production, and the application of sanitary procedures seems essential.

Pure lactic cultures develop fine flavors in butter and cheese, M. W. HALES (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 6, pp. 30–32, 56, illus. 1*).—

Different strains of lactic acid organisms were found to develop specific desirable flavors in butter and cheese.

Determination of extraneous matter in Cheddar cheese, E. G. Hood and W. H. Sproule (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 6, pp. 27–29, illus. 4*).—Determination was made of the extraneous matter collecting on filter disks when 12-oz. samples of cheese were saved in 16-oz. clean, large-mouth bottles and filtered after solution in sodium citrate.

Effect of various temperatures of storage upon chemical and physical properties of powdered egg yolk as related to its use in ice cream, P. H. Tracy, J. Sheuring, and W. A. Hoskisson. (Univ. Ill.). (*Food Res., 9 (1944), No. 2, pp. 126–131*).—Samples of four brands of spray-dried egg-yolk powder were stored for 18 mo. at temperatures of —5° to —20°, 40°, 70°, and 90° F. and judged for flavor, odor, and color and used as a constituent of ice cream mixes, with temperature and overrun determinations on the ice cream at 1-min. intervals. The body, texture, flavor, and melt-down characteristics were ascertained after 24 to 48 hr. The powdered-egg-yolk samples were analyzed periodically during storage for pH, solubility, total bacteria per gram, flavor, odor, and color. Storage of the yolk powder at room temperature or above resulted in a marked decrease in pH, an increase in the amount of insoluble material present, and a decrease in solubility. The color became less golden and the flavor less desirable as storage increased. Powdered egg yolk with milk solids present deteriorated rapidly on storage. The whipping properties of the mix and melt-down characteristics of the ice cream were not related to time and temperature of storage of the yolk powder.

VETERINARY MEDICINE

[Miscellaneous contributions from Brazil] (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 15–30, 157–194, 217–226, 273–292, illus. 34; Eng. abs., pp. 28–29, 190–191, 225, 289*).—These include Estudos sobre plantas tóxicas no estado de São Paulo—Ensaios toxicológicos com 27 plantas consideradas "suspeitas" [Studies on Poisonous Plants in the State of São Paulo—Toxicologic Experiments on 27 Plants Which Have Been "Suspected" of Toxicity], by M. Rocha e Silva; Estudos sobre a encefalomielite infecciosa dos equideos no Brasil [Studies on Infectious Equine Encephalomyelitis in Brazil], by V. Carneiro and R. Cunha, in which it is concluded that the Brazilian strain should be classified as a variety of the Eastern type; Técnica para of xenodiagnóstico da Habronemose gástrica dos equídeos [Technic for the Xenodiagnosis of Gastric Equine Habronemosis], by M. J. Mello and R. Cuocolo; and Revisão das espécies de "Trichomonas Donné, 1836" da galinha e do pombo domésticos [Revision of the Species of the Genus "Trichomonas Donné, 1836" From the Domestic Fowl and Pigeon], by C. Pereira and W. F. de Almeida.

[Miscellaneous contributions] (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 151 (1943), No. 1, pp. 21–50, illus. 1*).—The following articles are included: Untersuchungen über die Autolyse von Tollwutgehirnen [The Autolysis of Cerebral Rabies], by D. Ionescu (pp. 21–25); Ueber Vorkommen und Herkunft der Bakteriophagen bei Hühnern [The Occurrence and Efficacy of Bacteriophages in Poultry] (pp. 25–30) and Ueber Fundort und Umweltbeziehungen der Bakteriophagen [The Location and Prevalence of Bacteriophages] (pp. 30–38), both by J. Spalatin; Der Nachweis der Tuberkelbazillen in der Tiefenkultur im flüssigen Nährboden nach Kirchner [Proof of Tubercle Bacilli in Deep Cultures of Kirchner's Nutrient Solution], by L. Šula (pp. 39–46); Praktische Erfahrungen zur bakteriologischen Tuberkulosediagnose, insbesondere über einen neuen Eiersatz-Nährboden [Practical Experience in Bacteriological Tuberculosis Diagnosis], by C. Platz and I. König (pp. 46–48); Ueber die Hitzeempfindlichkeit der Tuberkelbazillen [The Heat Sensitivity of the Tubercle Bacillus], by E. Larmola (pp. 48–50).

[Miscellaneous studies from India] (*Indian Jour. Vet. Sci. and Anim. Husb., 13 (1943), No. 3, pp. 228–230, 240, 247–248, illus. 3*).—These studies include Observations on a Contagious Keratitis of Indian Sheep, by P. N. Nanda and M. Abdussalam (pp. 228–230); *Skrjabinema ovis* (Skrjabin, 1915) Wereschtschagin, 1925, an Oxyurid Parasite of the Goat (*Capra hircus*) in India, by S. N. Vaidyanthan (p. 240); and Some Observations on the Internal Body Temperature in Goats, by M. Nazir Sadiq (pp. 247–248).

[Miscellaneous contributions from Onderstepoort] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 19 (1944), No. 1–2, pp. 7–16, 17–22, 23–28, illus. 5*).—In addition to articles noted in more detail, this number contains The Transmission of Blue-Tongue and Horsesickness by *Culicoides*, by R. M. Du Toit; Some Remarks on Black Quarter Vaccines, by J. R. Scheuber; and A Note on Strains of Tuberculosis From the Cape Kudu, by E. M. Robinson.

Virus diseases in man, animal, and plant, G. SEIFFERT, trans. by M. L. TAYLOR (*New York: Philosophical Libr., 1944, pp. 322+, illus. 7*).—This work attempts to give a survey of the status of virus investigations, with special consideration of the major research work of the last decade. Following a general discussion, much space is given to specific diseases. A section on methods of investigation is appended.

A substance in animal parasites related to the human isoagglutinogens, J. OLIVER-GONZÁLEZ and M. V. TORREGROSA (*Jour. Infect. Diseases, 74 (1944), No. 3, pp. 173–177*).—A polysaccharide fraction has been isolated from the dried and pulverized material of *Ascaris suum, A. lumbricoides, Trichinella spiralis, Necator americanus, Schistosoma mansoni,* and the larval form of *Taenia solium.* When added to human serum, all polysaccharide fractions inhibited the α and β agglutinins in the serum. They also inhibited the hemolysis of sheep cells in a system consisting of Forssman antiserum, sheep cells, and guinea pig complement. The relations that may exist between parasitic infections and the autoagglutination of erythrocytes as a result of the immunization of the host by a substance in the parasite related to the isoagglutinogens are discussed.

Defective granular eggshell formation by Schistosoma mansoni in experimentally infected guinea pigs on a vitamin C deficient diet, C. KRAKOWER, W. A. HOFFMAN, and J. H. AXTMAYER (*Jour. Infect. Diseases, 74 (1944), No. 3, pp. 178–183, illus. 6*).—In these experiments "vitamin C deficiency in guinea pigs with schistosomal infection did not interfere with the growth and development of the parasites. Neither, to a certain extent, did it interfere with the fertilization of the ova and their subsequent limited (being lodged in tissues) miracidial development, except in such instances where bacteremia in the depleted host resulted in bacterial infection of the parasites proper. There was, however, considerable interference with the formation of normal eggshells."

In vitro effects of high temperatures on avian malarial parasites, F. E. CALDWELL (*Jour. Infect. Diseases, 74 (1944), No. 3, pp. 189–205, illus. 2*).—The thermal death point of *Plasmodium cathemerium* was determined to be 50° C. for 8 min. A few parasites survived after exposure to this temperature for 7 min., but evinced a prolonged incubation period when inoculated into animals. The variation found in three strains isolated from strain 3H1–2 are discussed.

Cultivation of the bovine tubercle bacillus, A. R. ARENA and A. CETRANGOLO (*Amer. Rev. Tuberc., 50 (1944), No. 1, pp. 58–67; Span. abs., p. 66*).—This is mainly a discussion of methods.

Experimental epidemiology of tuberculosis: The prevention of natural airborne contagion of tuberculosis in rabbits by ultraviolet irradiation, M. B. LURIE ET AL. (*Jour. Expt. Med., 79 (1944), No. 6, pp. 559–572, illus. 2*).—"Ultraviolet irradiation of the air of a room exercises a protective influence against natural air-borne contagion of tuberculosis in rabbits. When the radiant energy is of low intensity it reduces considerably the incidence of tuberculosis. It completely protects rabbits of high natural resistance from acquiring demonstrable disease though they become tuberculin sensitive. It fails to protect a small proportion of rabbits of low natural resistance from fatal tuberculosis.

"When the radiant energy is of high intensity all rabbits, whether of high or of low natural resistance, are almost completely protected from a contagion so severe that it is fatal to the great majority of rabbits of the same genetic constitution not protected by these rays. The protected rabbits do not develop tuberculin sensitivity.

"The contagion of tuberculosis in these studies is air-borne, and the radiant energy exercises its protective influence by its bactericidal properties. It is probable that ultraviolet irradiation may control air-borne contagion of human tuberculosis."

Experimental epidemiology of tuberculosis: Hereditary resistance to attack by tuberculosis and to the ensuing disease and the effect of the concentration of tubercle bacilli upon these two phases of resistance, M. B. Lurie (*Jour. Expt. Med., 79 (1944), No. 6, pp. 573–589, illus. 2*).—Studies carried on with two families of rabbits, one of high inherited resistance to tuberculosis and one of low inherited resistance, indicated that hereditary resistance to attack by air-borne tubercle bacilli is distinct from resistance to the ensuing disease. Increasing concentrations of tubercle bacilli in the environment of the family of high genetic resistance to the disease increase the incidence of infection, accelerate the onset of the disease, and affect its essential character in proportion to the concentration of the micro-organism. Up to a certain concentration of tubercle bacilli in the environment of the families of low genetic resistance to the disease, increasing concentrations of the infectious agent also increase the incidence of the disease and accelerate its onset, although its anatomical character is always of a uniform rapidly progressive type. Beyond this concentration further increment of the infectious agent exercises no effect.

The tuberculin test in guinea-pigs and cattle: The allergic response of animals to tuberculin and to extracts of non-pathogenic acid-fast bacteria, A. S. Canham (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 19 (1944), No. 1–2, pp. 29–70*).—From this comprehensive investigation the following conclusions are drawn:

"In guinea pigs a sufficient degree of infection with the organism of tuberculosis can be set up by artificial means so that reactions with tuberculin are given within from 24 to 30 days. This means that the period of 6–8 weeks usually elapsing before subjects injected with suspected tubercular material are killed for diagnosis can be shortened by testing the subject and a control with tuberculin in from 24 to 30 days, thus expediting results of tests.

"Animals infected with *Br[ucella] abortus* may give strongly suspicious reactions when tested with tuberculin. Reactions strongly suspicious of positive tuberculin reactions have been observed in cattle that were pregnant and close to the time of parturition. A similar case was observed in a control guinea pig. Guinea pigs infected with strains of nonpathogenic acid-fast organisms gave reactions in some cases when tested with tuberculin in a dilution of 1 : 100. More marked reactions to tuberculin were obtained when lower dilutions were used, viz, 1 : 10 to 1 : 40 dilutions.

"Extracts prepared from nonpathogenic acid-fast organisms, in the same way as tuberculin is prepared, appear to contain some antigenic factor common to all members of this group that gives rise to reactions when inoculated into small animals artificially infected with separate members of this group. Extracts prepared on the lines of L'anaexo-Tuberculin may contain products that are specific for each member of the acid-fast group of organisms.

"Cattle up to 2½ yr. of age can be sensitized by the subcutaneous inoculation of 10-mg. strains of *M[ycobacterium] butyricum* and *M. phlei* suspended in liquid paraffin. Larger amounts of the organisms do not appear to give rise to a greater degree of sensitivity. Cattle sensitized by subcutaneous inoculation of strains of *M. butyricum* and *M. phlei* gave definite suspicious reactions when tested with tuberculin by the double intradermal method. These same animals when tested with avian tuberculin showed no more marked suspicious reactions than when tested with standard tuberculin. Thirteen and a half months after subcutaneous inoculation with strains of *M. butyricum* the nonpathogenic organism *M. butyricum* could be cultivated from pus obtained from the resultant lesion. Sections cut from the lesions set up by these two organisms showed changes indistinguishable from those set up by tuberculosis. Four months after the surgical removal of the lesions set up by the inoculation of the nonpathogenic acid-fast organisms, the animals still gave definite positive reactions when tested against the corresponding extracts. It is probable that some nonspecific reactions shown by animals, when tested with tuberculin, may be due to these animals being sensitized naturally by a strain or strains of some nonpathogenic acid-fast organism. This may also be an explanation for some of the 'no lesion' reactors to the double intradermal tuberculin test."

There are 83 literature citations.

Bibliography of phenothiazine as an anthelmintic, R. T. LEIPER (*St. Albans, Eng.: Imp. Bur. Parasitol. (Helminthol.), 1942, pp. 6+*).—This bibliography includes 120 papers received between 1938 and June 1942. Technical papers on the chemistry of phenothiazine and its insecticidal or fungicidal uses are not included.

Evaluation of disinfectants, W. L. MALLMAN. (Mich. State Col.). (*Soap and Sanit. Chem., 20 (1944), No. 8, pp. 101, 119, 121, 123, 131, illus. 2*).—This is mainly a discussion of methods, especially the phenol coefficient. This is regarded as useful in aiding in the selection of ingredients and as a check on the resulting mixture for stability, but the final analysis, it is maintained, should be a use test. "A standard use test should be developed."

Some aspects of the toxicology of hydrocyanic acid in ruminants, S. J. VAN DER WALT (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 19 (1944), No. 1–2, pp. 79–160, illus. 6*).—This thesis discusses the quantitative determination of HCN in biological material, sources of HCN, factors concerned in the causation of HCN poisoning, and the HCN content of the organs of normal animals and animals poisoned by HCN. Among the conclusions drawn are the following:

"The aeration procedure is the most suitable for the liberation of HCN from biological material. The ferric thiocyanate method, as modified by the author, is an accurate and sensitive method in biological material. In the case of certain plants erroneous results were obtained by the alkaline titration method. . . . The HCN content of cyanogenetic plants varies greatly, one of the most important factors, responsible for the variation, being climatic conditions. Wilting is responsible for a great increase. . . .

"The danger of a cyanogenetic plant to stock should be assessed on the maximum quantity of HCN which the plant may develop. Under field conditions HCN in relatively large quantities was frequently demonstrable in the ruminal contents of animals which had died from causes other than HCN poisoning. Under laboratory conditions ruminal contents and liver of such animals, on a practically noncyanogenetic diet, contained only traces of HCN.

"In sheep poisoned by HCN per os the ruminal contents and liver show the highest concentration of HCN of the organs analyzed. The quantity of HCN ingested is reflected in the HCN content of the ruminal contents and liver. Since the presence of HCN in the ruminal contents does not prove that a lethal quantity of HCN was absorbed, a definite diagnosis cannot be made on the HCN content of the ruminal contents alone. The HCN content of the ruminal contents can, therefore, only serve as corroborative evidence for the HCN content of the liver. The livers of sheep given lethal quantities of HCN contained 0.14 mg., or more, of HCN per 100 gm., whereas the ruminal contents contained approximately 1.0 mg. or more. . . .

"During storage a decrease occurs in the HCN content of liver and ruminal contents, the decrease being very rapid in the former and more gradual in the case of the latter. Mercuric chloride is an excellent preservative of ruminal contents and liver, entirely preventing the decrease in the HCN during storage. Under the conditions of the author's experiments HCN did not develop in significant quantities during decomposition of liver and ruminal contents. In the intact animal after death HCN diffuses to a considerable degree into the liver from the ruminal contents. Chronic poisoning by HCN does not occur in a way similar to chronic poisoning by mineral poisons such as lead. Experimentally, HCN has been found to cause (1) chronic poisoning in the form of injury to the central nervous system and (2) goiter. The conditions under which these forms of poisoning were produced are such, however, that it is very unlikely that these forms of poisoning will occur naturally."

References numbering 104 are appended.

Experience with ascorbic acid therapy for sterility in cows, C. A. V. Barker (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 7, pp. 192-195*).—"Ascorbic acid therapy was apparently ineffective in three cases cited of sterility in cows. In one other case the use of ascorbic acid was apparently quite successful. In two other cases the ascorbic acid therapy may have been of some value in assisting those processes involved in the maintenance of early pregnancy. . . . From these observations it is apparent that ascorbic acid is of some value in treating certain types of sterility in cows."

Mastitis in dairy cows: A bacterial and leucocytic survey of the laboratory herd through four seasons, C. S. M. Hopkirk and T. Palmer-Jones (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 2, Sect. A, pp. 49-62, illus. 1*).—A general survey is given of a milking herd for four lactation periods. During the first two seasons the herd was hand-milked, while during the last two its reaction to a milking machine was studied.

The results indicated that it is possible to milk at a high vacuum (19 in.) without the development of mastitis, provided other factors are favorable. A sudden outbreak occurred, however, even with less vacuum, when the air admission holes of the machine were closed for two milkings. Some indication was seen that there is a lessening of the disease in quarters where stripping has been discontinued.

Mastitis and the resazurin test, P. S. Watts and A. C. Stirling (*Vet. Rec., 56 (1944), No. 11, pp. 83-85*).—Milk samples from 973 quarters of 247 cows in 8 herds were examined for infection with pathogenic bacteria, cell count, bacterial count, and resazurin test. Foremilk quarter samples, individual cow samples, and composite samples were tested separately. The samples examined were of a high bacterial standard, 95 percent giving counts of less than 100,000 per cubic centimeter. With such samples there was a close relationship between the resazurin test and the cell count.

Reduction of resazurin is believed to have furnished a reliable index of *Streptococcus agalactiae* infection in samples from individual quarters. Failure to reduce resazurin, however, did not imply freedom from infection, and the test is therefore deemed of very limited value for the routine diagnosis of mastitis.

Samples from individual cows showed a marked decrease in ability to reduce resazurin in comparison with quarter samples. In mixed milk, up to 73 percent of the milk could be derived from cows infected with mastitis without significantly affecting the resazurin test.

Bovine trichomoniasis, W. R. KRILL. (Ohio State Univ.). (*Vet. Med., 39 (1944), No. 9, pp. 345–347, illus. 2*).—A popular discussion of this disease and its treatment.

Acidophilus milk therapy in scours, C. E. PHILLIPS (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 7, pp. 189–191*).—Several field experimental cases of scours in calves and lambs are noted in which acidophilus milk proved of value.

Correlation of cobalt content of organs of healthy and bush-sick sheep at Glenhope, New Zealand, H. O. ASKEW and J. WATSON (*New Zeal. Jour. Sci. and Technol., 25 (1943), No. 2, Sect. A, pp. 81–85*).—Yearling lambs were pastured on a cobalt-deficient area until they became bush-sick, when they received twice weekly a drench providing 4 mg. of cobalt per dose for 20 weeks. Marked improvement was noted, and it is concluded that administration of cobalt restores to health sheep showing signs of cobalt deficiency. No definite indication was obtained that any one organ is the seat of action of the cobalt which determines the health of the animal.

The efficiency of the phenothiazine salt mixture and drench for sheep, W. T. S. THORP, W. L. HENNING, and J. F. SHIGLEY. (Pa. Expt. Sta.). (*Jour. Anim. Sci., 3 (1944), No. 3, pp. 242–249, illus. 2*).—Studies previously noted (E. S. R., 89, p. 483) were continued with five groups of ewes and lambs variously treated. From the results obtained the authors conclude that "the 1–9 phenothiazine and salt mixture, prepared by mixing 1 lb. of phenothiazine powder with 9 lb. of granular salt, if properly administered is an efficient nontoxic anthelmintic for mature sheep. The difference in efficiency for lambs and ewes is probably due to the fact that the young lamb does not consume enough of the salt mixture when needed most, and the further fact that the lamb is more susceptible than the ewe to parasitism. The use of phenothiazine and salt is a preventive measure and is not expected to control parasitism in heavily infested animals."

General recommendations believed warranted are as follows: "Treat all the sheep in the flock during the late fall or early winter with the phenothiazine drench. Repeat this treatment in the spring 1 to 2 weeks after all the ewes have lambed. Then, place the entire flock on the 1–9 phenothiazine and salt mixture. Drench the lambs in the flock with phenothiazine when they are 3 to 4 mo. of age. If it is a wet, warm season and the lambs show any evidence of parasitism, it may be necessary in some cases to drench them again. Under some conditions, particularly after using the fall and spring drench for several seasons, it may not be necessary to drench the ewes in the fall if they were drenched in the spring, providing the 1–9 salt mixture has been before them at all times. All the young stock kept over the winter should be drenched in the fall."

Sheep blowfly research.—VII, Investigations in the Cape winter-rainfall areas, H. O. MÖNNIG and P. A. CILLIERS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 19 (1944), No. 1–2, pp. 71–77*).—Investigations previously noted (E. S. R., 91, p. 468), which were carried out mainly in the summer-rainfall area of the Union of South Africa, were extended to the winter-rainfall area. In this area, where the rainfall is well distributed throughout the year, the climate is mild, and the humidity is relatively high, sheep are susceptible during all seasons, enabling *Lucilia cuprina* to cause strikes and to breed almost exclusively on live animals throughout the year. This fly was not found to breed in sheep carcasses at any time, and only a few individuals were obtained from four small carcasses in winter. The sheep carcasses produced mainly *Chrysomyia chloropyga* during the cooler months and *C. albiceps* and *C. marginalis* in summer; these species were not found to strike sheep. The questions of competition between *Lucilia* and *Chrysomyia* and of the conditions under which *C. chloropyga* causes strike are breifly discussed.

Observações sobre o abôrto contagioso das eguas em S. Paulo [Investigations on equine abortion in São Paulo], M. D'Apice (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 235–242; Eng. abs., p. 241*).—In an outbreak of infectious abortion in mares, *Salmonella abortus equi* has been readily obtained from the fetal membranes. Sanitary measures and vaccination with a phenolated suspension of the etiological microorganism (three doses of 5 cc. by the intramuscular route following the third month of pregnancy) led to a definite control of the disease.

The anhydraemia of oxalate poisoning in horses, J. Stewart and J. W. McCallum (*Vet. Rec., 56 (1944), No. 10, pp. 77–78*).—Continuing studies previously noted (E. S. R., 83, p. 399), the authors find from doses of oxalic acid and oxalates of sodium, ammonium, and calcium that there are slight differences in the symptoms of oxalate poisoning and grass sickness, and that the essential pathology of the two conditions is distinct. Since some of the symptoms are common to both, however, care in the diagnosis of grass sickness is deemed necessary.

The true relation of vitamin A to respiratory infections, J. L. Davidson (*Vet. Med., 39 (1944), No. 9, pp. 342–344, illus. 1*).—Following this discussion and his own experience with routine administration of large doses of vitamin A in canine distemper cases, the author concludes that "the inclusion of vitamin A in adequate dosage in the treatment of respiratory infections is certainly worthy of consideration."

On the parenteral administration of sea-water in the treatment of canine mange-sarcoptic and follicular, K. Venkatachalam, A. N. Ratnagiriswaran, M. R. Subramania Sastry, R. Ramaswamy, and C. K. Velayudhan Nayar (*Indian Jour. Vet. Sci. and Anim. Husb., 13 (1943), No. 3, pp. 244–246, illus. 1*).—About 20 cases of sarcoptic and 30 of follicular manges in dogs are reported to have been treated with success by the injection of sea water either intraperitoneally or intravenously. The general condition of the affected animals was thereby greatly improved. A case of ringworm in a bull was also treated successfully with intravenous injections.

Parasitism and its effects on fur animals, F. X. Gassner. (Colo. Expt. Sta.). (*Amer. Fur Breeder, 16 (1944), No. 10, pp. 18, 20, 22–23; 17 (1944), Nos. 1, pp. 20, 22; 2, pp. 32–38*).—This address discusses the various parasitic infestations and their control.

Helminth infections in relation to population fluctuations in snowshoe hares, A. B. Erickson. (Minn. Expt. Sta. et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 134–153, illus. 6*).—The author has studied animal parasites in the gastrointestinal tracts of about 1,000 snowshoe hares collected by R. G. Green over almost one entire 10-yr. period (September 1931-December 30, 1940). The animals were taken during all seasons, and represented both sexes and all ages. The study included both the worm parasites and host reactions to their worm burdens.

Stomach worms, trichostrongylids, pinworms, and tapeworm larvae (*Taenia pisiformis*) apparently were inportant in reducing the resistance of hares to other decimating factors and in killing some animals outright by sucking blood (stomach worm and trichostrongylids), by utilizing food, by producing toxins (*Trichostrongylus calcaratus* and probably *T. affinis, Obeliscoides cuniculi,* and *Protostrongylus boughtoni*), and by causing erosion of the gastric glands, inflammation and thickening of the pyloric valve, spindle-cell sarcoma (stomach worms), liver damage (*Taenia pisiformis*), and lung damage (*P. boughtoni*), thus directly or indirectly influencing the decline of hare populations in Minnesota from 1935 to 1939.

Lamellar cataract in chickens, H. M. DeVolt. (Univ. Md.). (*Poultry Sci., 23 (1944), No. 4, pp. 346–348, illus. 1*).—A number of cases encountered in a brood of chickens subjected to strong light in a basement and a modified war-time ration are noted.

What to do when "blue comb" strikes, E. Jungherr (*Poultry Tribune, 50 (1944), No. 7, pp. 9, 41–42, illus. 2*).—This disease, also referred to as pullet disease and summer disease, is discussed as to symptoms, course, and suggested treatment.

Vacinação e mortalidade na cólera aviária [Increase in mortality following vaccination against fowl cholera], J. Reis and R. C. Bueno (*Arq. Inst. Biol. [Sao Paulo], 14 (1943), pp. 81–86; Eng. abs., pp. 85–86*).—The authors report that mortality due to fowl cholera may be highly increased when a living vaccine (109 T) is applied to the flock at the onset of the epidemic. Controlled experiments have shown this to be due to the presence, in the early stages of the epidemic, of a large number of birds which temporarily harbor the fowl-cholera micro-organism in the palatine cleft. Healthy carriers, defined as birds in whose mouth cavity the micro-organism succeeded in becoming established, are able to withstand with no harmful effects the inoculation of the living vaccine.

It is concluded that the living vaccine should not be used in the early stages of an epidemic, and that the test for the detection of healthy carriers should be made only after it begins to subside.

The development of families of chickens free of lymphomatosis, N. F. Waters and C. O. Prickett. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 4, pp. 321–333, illus. 6*).—Observations of the mortality of 3,223 White Leghorns bred for resistance and susceptibility to lymphomatosis, hatched and reared in mixed populations or in isolated pens, are recorded for the 4 yr. 1939–42. Birds died from the disease at 40 to over 1,200 days of age. The high incidence of lymphomatosis among nine different strains confined to isolated quarters, even though infectious diseases and parasites, except coccidiosis, were prohibited, incriminated the egg as a carrier of the condition. Conclusive evidence also showed that the disease may be spread by contact.

Leucose linfóide hemocitoblástica da galinha [Hemocytoblastic lymphoid leucosis of poultry], J. F. de Salles (*Mem. Inst. Oswaldo Cruz, 39 (1943), No. 3, pp. 385–388, illus. 3; Eng. abs., p. 388*).—Two cases are described in which the lesions are characterized by a marked enlargement of the liver and intense lymphocytic infiltration. The cells are classified as hemocytoblastic, since they produce erythrocytes, myelocytes, and lymphocytes.

A Salmonella enteritidis infection associated with leg deformity in turkeys, W. A. Higgins, J. B. Christiansen, and C. H. Schroeder (*Poultry Sci., 23 (1944), No. 4, pp. 340–341, illus. 2*).—A type of hock disorder severely affecting at least 100 of a flock of about 900 turkeys to a degree preventing their being marketed in the usual manner is noted.

The relation of selenium to western duck sickness, H. W. Lakin, E. R. Quortrup, and N. Hotchkiss (*Auk, 61 (1944), No. 3, pp. 415–420*).—Following a reconnaissance survey in North Dakota, Montana, South Dakota, Nebraska, Utah, Oregon, and California of areas in which losses from western duck sickness were known to exist, livers and gizzards of both sick and healthy waterfowl were analyzed for selenium, as were also samples of mud from each area and some samples of vegetation. While selenium was generally present in detectable quantities it did not "appear to be a factor in western duck sickness. . . . That the small amounts of selenium in their diet and drinking water should cause the tremendous losses of waterfowl experienced in some of these areas is most unlikely."

AGRICULTURAL ENGINEERING

Irrigation science—the foundation of permanent agriculture in arid regions, O. W. Israelsen (*Logan: Utah State Agr. Col., 1943, pp. 22+*).—This is the second of the annual faculty research lectures of the Utah State Agricultural College. Its contents are as follows: World's irrigated areas, climate and irrigation, water storage essential to irrigation, the silt problem, underground water storage, conveyance of irrigation water, irrigation water requirements, consumptive use of water, water-application efficiencies, erosion control on irrigated lands, irrigation and alkali, and permanent agriculture in arid regions.

Surface water supply of the United States, 1942, parts 2, 13 (*U. S. Geol. Survey, Water-Supply Papers 952 (1944), pp. 477+, illus. 1; 963 (1944), pp. 232+, illus. 1*).—These papers record measurements of stream flow for the year ended September 30, 1942, No. 952 covering the South Atlantic slope and the eastern Gulf of Mexico basins and No. 963 the Snake River Basin.

Chemical character of surface waters of Georgia, W. L. Lamar (*U. S. Geol. Survey, Water-Supply Paper 889-E (1944), pp. 317–380+, illus. 11*).—This paper contains information shown by 470 analyses of samples collected at 96 sampling points. Each of 10 tables gives 36 analyses of 10-day composites of samples collected daily for a year at or near a gaging station. These tables include arithmetical and weighted averages for the year. A further table gives analyses for 90 spot samples.

Ground waters abundant but exhaustible natural resource; must be used with care, W. E. Code (*Colo. Farm Bul.* [*Colorado Sta.*], *6 (1944), No. 4, pp. 11–14, illus. 1*).—The author outlines the nature and availability of the ground waters in various parts of the State. In general he considers the ground water of Colorado a quick and substantial supplemental water supply which should be looked upon as a reserve to level off inequalities in stream flow rather than as a source suitable to be worked as a primary supply.

Ground-water resources of the Houston district, Texas, W. N. White, N. A. Rose, and W. F. Guyton (*U. S. Geol. Survey, Water-Supply Paper 889-C (1944), pp. 141–289, illus. 10*).—This report covers the current phase of an investigation of the supply of ground water available for the Houston district and adjacent region, Texas, in progress during the past 10 yr. The field operations included routine inventories of pumpage, measurements of water levels in observation wells and collection of other hydrologic data, pumping tests on 21 city-owned wells to determine coefficients of permeability and storage, and the drilling of 13 deep test wells in unexplored parts of the district. Considerable attention was given to studies of the location of areas or beds of sand that contain salt water.

Exploratory water-well drilling in the Houston district, Texas, N. A. Rose, W. N. White, and P. Livingston (*U. S. Geol. Survey, Water-Supply Paper 889-D (1944), pp. 291–315, illus. 10*).—Thirteen deep test wells 5½ in. in diameter, and ranging in depth from 360 to 2,000 ft., were put down with a hydraulic rotary drill by the city of Houston in the spring and summer of 1939. The average depth was 1,246 ft. All were electrically logged. Samples of cuttings were collected from the drilling mud after every 20 ft. of drilling. In 6 of the wells sand samples were obtained by core drilling in beds at selected horizons, about 230 ft. being recovered. A total of 15 samples of sand and water were obtained from 8 wells by the drill-stem method. Side-wall sampling was attempted. Six of the test holes were cased with 3½-in. casing (inside diameter) and equipped with screens so that water-level measurements could be made and samples of water collected for chemical analyses. Selected sand samples were analyzed and tested in a field laboratory for mechanical composition, permeability, and porosity. The field and laboratory data were studied with special reference to the significance of the electrical logs.

Comparison of the electrical logs of the test wells with the driller's logs showed that, on the whole, they agreed remarkably well in fixing the upper and lower limits of the thicker beds of sand and clay, but that the agreement was not so close where the beds were thin. Varying results were obtained from attempts to correlate the second curve of the electrical log with the permeability and mechanical composition of the sand samples obtained by core drilling and drill-stem sampling. These and other observations are reported upon in detail.

Snow surveys and irrigation water forecasts for the Missouri and Arkansas Drainage Basins, February-May 1944. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, Feb., pp. 9; Mar., pp. 9; Apr., pp. 11; May, pp. 13*).—Water available as snow cover and storage is shown for each of the four months covered by these reports, with predictions of supply for the forthcoming irrigation season based upon these observations.

Canal lining experiments in the Delta Area, Utah, O. W. ISRAELSEN and R. C. REEVE. (Coop. U. S. D. A.). (*Utah Sta. Bul. 313 (1944), pp. 52+, illus. 22*).—Cooperative canal lining experimental work in the Delta Area has shown that careful measurements of seepage losses in canals which seem to need lining should be made during at least one season before lining. Since losses vary greatly from place to place along canals, current meter or other inflow-outflow measurements may not give all of the information needed as a basis for decision to line the canal or for design of the lining. Natural clays having low permeabilities suitable for lining canals to reduce seepage losses are abundant in the Delta Area, and lining of many canal sections with clay is financially feasible. Lining some canal sections will pay well in terms of the annual water saving. Lining of irrigation canals in the Delta Area not only saves water for use on the land but also improves drainage conditions, reduces drainage costs, conserves soils, improves highways, and protects basements from flooding. In large-scale operations in clay lining, costs can be greatly reduced by the use of modern heavy machinery for loading, hauling, spreading, and compacting.

Tile drainage for increased production, C. H. VAN VLACK and R. A. NORTON. (Coop. U. S. D. A.). (*Iowa Sta. Bul. P65 (1944), pp. 145–175, illus. 29*).—This bulletin contains brief introductory statements by B. J. Firkins on the importance of drainage in soil management and on management practices which improve drainage conditions. Its further contents are drainage ditches, essential requirements for tile drains, the tile outlet, location of tile drains, depth and spacing, securing greatest possible fall, selection of tile, laying the tile, maintenance of the system, table showing areas drained by tile, and what is wrong with our drainage systems.

Blasting for food, C. P. STEVENS (*U. S. Dept. Agr., Soil Conserv., 10 (1944), No. 1, pp. 9–11, illus. 3*).—Drainage of some 1,200 acres of swamp land previously useless or nearly so and successful use of the drained land for hay production and pasture was accomplished in the Montesano-Elma-Oakville Soil Conservation District of western Washington by blasting 15,000 ft. of drainage ditch. Farmer owners were able, after 2 days of instruction by technicians, to take over the work of blasting ditches for themselves, the work having been simplified by the use of the propagation method of firing. The only equipment needed consisted of "T" punch bars, a small electric detonator, and 300 ft. of blasting wires. In an illustrative instance, the cash cost of a 2,400-ft. ditch was $307.22, or 9 ct. a cubic yard, not counting the owner's own labor. On this project the three farmers were able to load and shoot 500 ft. of ditch in one 8-hr. day.

Removal of apple trees, C. W. ELLENWOOD, T. E. FOWLER, and J. T. YODER, JR. (*Ohio. Sta. Spec. Cir. 68 (1943), pp. 16, illus. 17*).—This circular discusses briefly the methods of direct tractor pulling, block and tackle pulling, and dynamite, illustrations and examples having been taken from the station's experience in the removal of a 7-acre orchard planted in 1893 and later replacements. The blasting method is found to have the advantages of leaving the roots free from soil and causing less breakage of limbs and trunks and of leaving less roots in the soil to interfere with the planting of a new orchard. In blowing out 153 trees, 295.5 lb. of dynamite were used. On the larger trees, 2.5–3 lb. were used. Fuse-cap exploders with wire attachments 6 ft. long were used to explode the dynamite. The work was done during the winter months when the soil was moist. The fuse-cap exploders were fastened to a two-way insulated wire circuit about 100 ft. long, and when the charge was in readiness, the other ends of these wires were placed in contact with the poles of a second-hand automobile battery. The fuse-cap exploders were considered safer and also more dependable than powder fuse.

[Adhesive from cottonseed protein] (*Mississippi Sta. Rpt. 1943, p. 16*).—Hard rock maple having been used as the test wood, shear tests showed over 2,000 lb. per square inch breaking strength for this adhesive.

Electric fencing may be a great economic convenience or a hazard, J. E. NICHOLAS (*Pennsylvania Sta. Bul. 446, Sup. 3 (1944), pp. 8–9, illus. 3*).—The author gives a brief popular outline of the principles involved in controller construction, emphasizing the virtual impossibility of proper home-made construction. Repairs most often required are indicated. Precautions necessary in the correct setting up of electric fencing are described. The necessity for well-grounded lightning arrestors because of the required insulation of the fence wires from the ground is pointed out. The effectiveness of electric fences properly built, controlled, and maintained, is indicated.

Tillage tools, A. W. CLYDE and R. J. MCCALL (*Pennsylvania Sta. Bul. 465 (1944), pp. 40+, illus. 34*).—Part 1 of this bulletin deals with plow adjustment under the subheadings of plow-bottom alinement, heel clearance, colters and jointers, plow hitching, walking plows, disk plow hitching, etc. The second part, technical features of tillage tools, discusses methods of trial, nature of soil forces, moldboard plows, disk plows, spring tooth harrows, and disk harrows (18- and 22-in. disks).

Buck rakes, C. B. RICHEY and R. D. BARDEN. (Coop. U. S. D. A.). (*Columbus: Ohio State Univ., 1942, pp. 8, illus. 4*).—In a comparative table of various data on hay-handling methods, the auto buck rake is shown as performing the work at the lowest average total cost ($1.03 per ton), the tractor buck rake following with $1.37 per ton, stationary chopper and buck rake $1.52, wagon and loader $1.76, and other methods with higher costs up to $2.60 per ton for the pick-up baler. Several uses other than that of dry-hay handling are also noted. The buck rake was found a very popular tool.

For bringing hay to the barn a suitable buck rake should have (1) capacity of from 700 to 1,000 lb. per load, especially important if the length of haul exceeds ⅛ mile one way; (2) speed of at least 8 miles per hour, also especially important on the longer hauls; (3) width which gives adequate clearance for ordinary gates and lanes—a 10-ft. width with 12-ft. teeth is a combination very popular with Ohio farmers; (4) a lift of 4 ft. or more at the ends of the teeth. This prevents the hay from dragging and stirring up dust, and also from shaking off while being hauled; and (5) a power lift, since much effort is required to lift a 1,000-lb. load to the required height. For automobile- or truck-mounted rakes, rear-end mounting is favored. The disadvantage of having to load in reverse is outweighed by the following advantages: (1) No loss of traction when the load is lifted; (2) more cooling air for the radiator; (3) easier to maneuver through gates, lanes, and around corners; (4) less side motion of the teeth when loading, thus reducing breakage; and (5) better driving vision.

Three sheets of plans show design suggestions for two types of rake frames, two kinds of automobile power lifts, and a tractor rake carrier and power-take-off lift. The plans do not show all the details because some of these must vary according to the make and model of the automobile or tractor.

Buck rake construction and use on New Hampshire farms (*New Hampshire Sta. Bul. 351 (1943), pp. 15–16*).—The construction and use of this type of haying implement is being experimented upon at the university farm. Because of its relatively long wheel base and heavy engine, necessary for counterbalancing the weight of the loaded rake at the rear, a 1931 sedan, of a well-known make, was selected for the power unit. The rake itself was constructed according to the Ohio plan noted above, with a few adaptations made necessary by available materials and by the frame construction of the power unit. The rake was attached to the power unit by construction of a hinge, using ¾-in. pin. A power-driven hoist is a necessary time saver.

Pick-up hay balers save time and labor in a busy season, W. E. SCHROEDER and W. F. ACKERMAN (*Pennsylvania Sta. Bul. 446, Sup. 3 (1944), pp. 6–7, illus. 2*).—It was found possible to put hay into 16- by 18-in. balers rather loosely tied at moisture contents of 25 percent or as high as would permit safe storage of loose hay. It is noted as an index of proper baling tightness that the 16- by 18- by 36-in. bale of 25 percent moisture content should weigh about 50 lb.

With respect to rate of baling, experiment showed that under favorable conditions with an automatic-tying machine, more than 4.5 tons of hay can be baled per hour with a two-man crew, one man on the baler and one on the tractor; and that this work could have been done by one man alone, since the man on the baler did nothing but watch the tying mechanism which as now perfected needs little attention. By hitching a low, rubber-tired wagon to the baler and putting an extension on the baling chute, the bales were pushed onto the wagon.

Special ventilation in storage was found needless. Many bales of alfalfa were stacked on a barn floor with no particular ventilation provided other than unevenness of the bales and looseness obtained by stacking at right angles to the layer below. All seemed to keep well despite a moderately high moisture content. Other bales were stored in hay mows and a corn crib. Some discoloration occurred in the hay which had been purposely baled very wet, but mold was not found and practically all of the bales were in good shape after several months. Temperatures of some of the bales indicated that there is no danger of fire resulting from the storage of these loose bales, even though moisture content is as high as 30 percent.

Cylinder adjustments for threshing barley, H. H. DELONG (*South Dakota Sta. Bul. 377 (1944), pp. 8, illus. 5*).—The author finds that threshing barley for feeding purposes often requires a cylinder adjustment different from that used for threshing barley for the malting trade. All three types of cylinders—the rubber-faced bar, the rasp bar, and the spike tooth—may be adjusted to thresh barley to suit both the feeder and the maltster. A slight advantage of the rubber-faced bar cylinder seems to be its ability to thresh without excessive cracking or skinning barley kernels. Any end play in a spike-tooth cylinder may be a cause of cracked kernels. Bent cylinder teeth or concave teeth cause cracking of barley grains. Cylinder bar speeds above 6,000 ft. per minute cause mechanical damage to barley kernels regardless of concave clearance. Cylinder bar speeds less than 4,700 f. p. m. fail to do an adequate job of threshing. Handling threshed barley with the drag elevator or with shovels does not increase the mechanical damage. Elevating barley with the grain blower causes very slight additional cracking when run at recommended speeds. However, if the blower is run above recommended speeds additional cracking is noticeable. Frequent minor changes may be necessary in concave clearance or cylinder speeds, or both, during the day to compensate for changes in temperature or in the moisture content of straw and grain.

What speed of operation for a potato digger causes the least amount of injury, T. E. Long (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, pp. 15–19, illus. 7*).—The speed of 47 potato digger aprons and the percentage of major and minor injuries were recorded during the 1942 and 1943 seasons to find a relationship between the speed of the digger apron and the amount of injury.

The summation of all the data showed the lowest percentage of injury when the digger apron was operated between 220 and 240 ft. per minute. The results from the three individual diggers checked showed the lowest percentage of injury when the digger apron was operated at approximately 210 f. p. m. There was a definite similarity between the curves representing the 47 diggers and the three individual diggers. The linear regression of the data from all the diggers showed no significant straight line relationship.

Sacker attachment for power-driven potato digger, O. W. Monson *et al.* (*Montana Sta. Cir. 180 (1944), pp. 8, fig. 1*).—The Montana potato-sacking attachment consists of a secondary power-driven apron or conveyor, attached to the digger, which conveys the potatoes from the digger to a sacking hopper instead of letting them fall to the ground. Small platforms are provided on either side of the machine on which workers stand to remove rocks, clods, and vines as the potatoes are carried to the sacking hopper. Stock parts are used as much as possible and the construction of the entire machine, including frame and moving parts, involves only simple blacksmithing and arc welding operations. A mechanical description, bill of materials, and drawings are included in the circular, and working blue prints are available from the station.

Preventing cotton-press damage (*U. S. Dept. Agr. Leaflet 241 (1944), pp. 8, figs. 5*).—During the pressing of cotton at gins, overweight and irregularly packed bales cause undue stress on the tramper and press and cause costly and untimely break-downs. Extra time may be required to tie out these bales. They are also difficult to handle and load for transportation from the gin to the warehouse and cause complications in storage. During compression, heavy-weight bales produce extra strain on compress equipment and delay the pressing and handling operations, causing loss in time and additional expense.

It is suggested that cotton growers should send to the gin only quantities of seed cotton that will produce bales weighing from 450 to 550 lb. The ginner can divide lots of seed cotton on wagons or trucks in such a way as to gin uniform-weight bales when there are two or more bales from the same farm, and he can encourage the grower to provide some kind of a partition for keeping cotton for each bale separate on the wagon or truck. During ginning, the lint must be evenly distributed in the press box in order to prevent rolling or heavy-sided bales. Such bales result primarily from faulty action of the tramper and lint-slide kicker. The kicker speed and action should be adjusted to synchronize with the action of the tramper and give uniform distribution of the cotton within the press box. Since the moisture content of cotton varies throughout the ginning season, the kicker should be watched closely and changed from time to time to meet varying conditions.

A new design of press-box dog mechanism, recently developed at the U. S. Cotton Ginning Laboratory, Stoneville, Miss., primarily to avoid the formation of dog ridges in gin bales that cause the bales to cut during compression, has been found to be effective in providing uniform distribution of the cotton through the bale box. The mechanism consists of two prismatic plates, one for each side of the box, hinged and pivoted for rotation within an opening along the upper part of the sides of the press box, and means for rotating the plates into horizontal position to retain the cotton in the bale box during the tramping operation and to return the plates to vertical position during the pressing period. Some description of this device is given and its use is illustrated in a drawing.

Potato storage construction (*New Hampshire Sta. Bul. 351 (1943), pp. 14–15*).—Experiments with bins holding about 300 bu. each are briefly discussed.

Between a bin equipped with a central flue at the bottom and one in which the entire bottom was constructed of slats, little difference in loss of weight was evident. Other bins were so constructed that fall cooling was obtained either by natural draft or gravity or by use of a suction fan. The fan cooled the bin to the desired temperature in about 10 days, whereas the gravity method required from 4 to 5 weeks. After the bins were cooled to 38° to 40° F., the flues were closed to exclude outside air. Each bin had a false partition in the back to circulate the same air within the bin.

The bins cooled by gravity had an average smaller loss of weight (1.79 percent) than the one cooled more rapidly by suction fan (2.81 percent), and when the potatoes in the bin can be cooled in from 4 to 5 weeks the results are found satisfactory. The storage period covered in this experiment was from 5 to 8 mo. The tubers selected were free from bruises. Length of storage period had little effect on the loss of weight, provided the potatoes were cooled reasonably quickly to about 38° or 40° and held as near that temperature as possible.

In another test on tubers kept in crates during 8.5 mo. of storage so that there was free circulation of air around each crate, uninjured potatoes lost 3.08 percent of their weight and an injured lot 5.68 percent.

Cold storage lockers and locker plants: A list of references, D. W. GRAF (*U. S. Dept. Agr., Libr. List 11 (1944), pp. 32*).—This list of references covers the years 1930 through April 1944. Although it contains some references on the handling of frozen foods in locker plants, the list is not considered to be a bibliography on the frozen food industry. The articles cited deal mainly with mechanical and structural engineering and accessory equipment.

Temperature drop in ducts for forced-air heating systems, A. P. KRATZ, S. KONZO, and R. B. ENGDAHL (*Ill. Engin. Expt. Sta. Bul. 351 (1944), pp. 60, illus. 15*).—The detailed investigation here reported upon dealt with such phases as the heat loss from galvanized-iron ducts carrying heated air and the resulting drop in temperature in the air flowing in the ducts; the emissivity coefficients for radiation from the surface of commercial, galvanized-iron ducts; extent and nature of the temperature stratification of the air flowing and the effect of such stratification on the heat loss and on the experimental methods required; the effect of the velocity of the flowing air on the heat loss from the duct and on the drop in temperature of the air; correlation of the heat transfer coefficients based on the air films inside and outside of the ducts with similar film coefficients given by other investigators; and derivation of curves giving the relations between the size and shape of the duct, the air velocity, and the temperature drop occurring in any given length of duct. The studies were confined to uninsulated, horizontal, round, square, and rectangular ducts of sizes and aspect ratios commonly used in forced-air heating systems. All ducts were freely suspended in the air without interference from joists or other nearby surfaces.

Brooder fuel substitutes, C. P. HART (*Rhode Island Sta. Misc. Pub. 19 (1944), pp. 5*).—Pea coal gave satisfactory results when substituted for chestnut coal in the proportions of 25 and 50 percent. The mixtures with 50 percent pea coal, however, needed greater attention to insure proper burning. Some pea coal passed through the grates. When 75 percent pea coal was used the result was unsatisfactory due to clogging, slow burning, and large proportions of pea coal passing through the grate. Nut coke as a substitute for chestnut coal in the proportions of 25 and 50 percent gave satisfactory results, but during periods of strong winds required additional attention to prevent burning out. Nut coke 75 percent, with 25 percent of chestnut coal, was not satisfactory due to the rapid burning of the coke, especially during strong winds. A mixture of 50 percent pea coal and 50 percent coke was a satisfactory mixture where a low fire was required and when exposed to light winds only. During winter conditions this mixture would require considerable attention.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 25 (1943), No. 4, pp. 743–758, 777–889, illus. 5*).—Included are the following papers which have not been otherwise noted: Chronic Surpluses of Agricultural Commodities in the Post-War Period, by B. S. White, Jr., and E. T. Denhardt (pp. 743–758) (U. S. D. A. et al.); Controlling Hog Prices During the Transition From War to Peace, by G. Shepherd (pp. 777–792) (Iowa Expt. Sta.); Internal Trade Barriers for Margarine, by L. D. Howell (pp. 793–806) (U. S. D. A.); Government Control After the War, by R. A. Brady (pp. 807–821) (Univ. Calif.); A Reaction to Land Value Control Proposals, by C. H. Hammar (pp. 822–834) (Mo. Sta.); Essential Food Requirements in Wartime, by M. K. Bennett (pp. 835–847) (Univ. Calif.); Food Waste in Distribution and Use, by W. Kling (pp. 848–859); and Hypotheses in Land Tenure Research, by O. D. Duncan (pp. 860–868) (Okla. A. and M. Col.).

Also included are notes as follows: Discussion by S. v. Ciriacy-Wantrup of a paper on food production policies in wartime (pp. 869–874) (Univ. Calif.) (E. S. R., 90, p. 401); Crop Yield Index Numbers, by E. J. Working (pp. 874–881) (Univ. Ill.), making comments on some criticisms of the author's article (E. S. R., 84, p. 681); and Graphic Methods of Presenting Multiple Correlation Analysis, by D. G. Card (pp. 881–889) (Univ. Ky.).

[Papers on agricultural economics] (*Jour. Farm Econ., 26 (1944), No. 1, pp. 272+*).—Included are the following papers, with discussions, most of which were presented at the meeting of the American Farm Economic Association held at St. Louis, Mo., September 15–16, 1943: World Conditions in the Postwar Period That Will Affect Mississippi Valley Agriculture, by H. C. Taylor (pp. 1–9); Redirecting World Agricultural Production and Trade Toward Better Nutrition, by F. F. Elliott (pp. 10–30) (U. S. D. A.); Rehabilitation of Agriculture in German-Occupied Europe, by E. Jensen (pp. 31–45); America Looks at Russian Agriculture, by L. Volin (pp. 46–58); Nationalistic Trends in Agricultural Policy, by A. P. Chew (pp. 59–76) (U. S. D. A.); Transition Readjustments in Agriculture, by T. W. Schultz (pp. 77–94); Desirable Changes in the National Economy After the War, by K. E. Boulding (pp. 95–100) (Iowa State Col.); Desirable Changes in the National Economy for the Postwar Period, by M. Ezekiel (pp. 101–109) (U. S. D. A.); Price Control and the Wartime Pricing of Farm Products, by E. J. Working (pp. 110–123) (Univ. Ill.); Wartime Developments in Farm Credit and Their Postwar Implications, by A. G. Black (pp. 124–143) (U. S. D. A.); Wartime Developments in Food Processing and Preserving, by J. B. Canning (pp. 144–158); Wartime Transportation of Farm Products, by A. A. Dowell (pp. 159–180) (Univ. Minn.); Measuring Maximum Contribution to Food Needs by Producing Areas, by R. L. Mighell and R. P. Christensen (pp. 181–196) (U. S.

D. A.); Problems of Achieving Maximum Food and Fiber Production in the Mississippi Valley, by H. C. M. Case (pp. 197–213) (Univ. Ill.); Working With Farmers to Achieve Maximum Production, by L. G. Allbaugh (pp. 214–231) (Iowa State Col.); Farm Work Simplification Studies, by E. C. Young (pp. 232–239) (Purdue Univ.); and Implications of Land Value Control, by W. G. Murray (pp. 240–257) (Iowa Expt. Sta.).

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 26 (1944), No. 2, pp. 273–358, 373–405, illus. 5*).—Included are the following papers not noted elsewhere: Cotton Surplus Disposal Programs, by L. D. Howell (pp. 273–291); Cooperative Relationships and Business Performance, by M. A. Abrahamsen (pp. 292–308) (W. Va. Expt. Sta.); Future Trends in Germany's Agricultural System, by N. Robinson (pp. 309–326); Measuring the Effect of Agricultural Advertising, by A. F. Wolf (pp. 327–347); and Some Economic Effects of Graduated Income Tax Rates on Investors in Farm Capital, by A. A. Dowell and G. E. Toben (pp. 348–358) (Univ. Minn.).

Notes as follows are also included: Vertical Farm Diversification, by D. H. Doane (pp. 373–378); In Defense of an Adequate Diet, by W. Kling (pp. 379–382) (U. S. D. A.); The Influence of Prices on Agricultural Production, by W. C. Waite and R. W. Cox (pp. 382–388) (Univ. Minn.); Interpretation of Variations in Cost for a Group of Individual Firms, by H. E. Erdman (pp. 388–391) (Univ. Calif.); Farmers' Investments—A Neglected Field, by L. F. Miller (pp. 391–396) (U. S. D. A.); The Shift Toward Medium Staple Cotton, by C. D. Hyson (pp. 396–399); and Volume of United States Exports and Imports of Foods, 1909–43, by G. L. Nelson (pp. 399–405) (U. S. D. A.).

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul. 6 (1944), No. 6, pp. 36–41*).—An article, Land Market Activity in North Dakota, by R. L. Berger (pp. 36–38) (coop. U. S. D. A.), includes tables with discussion showing the voluntary and distress transfers and the number of properties sold by type of sellers and buyers by tenure in Morton, Stutsman, Traill, and Ward Counties during the first three months of 1943 and 1944. The tables of farm prices, by P. V. Hemphill (pp. 39–41), are brought down to June 15, 1944.

Statistical investigations of farm sample surveys in Iowa, Florida, and California, R. J. Jessen and E. E. Houseman. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul. 329 (1944), pp. 261–338, illus. 8*).—The results are presented of a statistical analysis of data obtained in surveys by the grid method of sampling made primarily to secure facts on farm employment in the 99 counties of Iowa, 26 of the 67 counties of Florida, and 9 California counties. The findings and conclusions were that the grid method of sampling "can be adapted to widely differing farming situations and if properly used will provide unbiased samples of farms.

"The most suitable size of grid for sampling varies according to the nature of the farming area and to the kind and extent of stratification, the method of estimation or expansion and cost situations for the kinds of inquiries being considered. The best size of grid for the surveys considered seems to be somewhat between a quarter-section and a full-section.

"Stratification, if properly applied, is an effective and efficient means of reducing sampling error. In many of the counties where farm types differ so widely, such as in California and Florida, stratification by geographic area alone does not effectively divide the sampling population into groups which are homogeneous enough. In these regions schemes of stratification which make some use of information available on such features as land use and the number of farms per grid should be employed.

"The farmstead appears to be a suitable criterion to use in determining which farms at the grid are to be enumerated. In the case where a farm does not have a farmstead it is advisable to provide a substitute criterion such as its northwest corner.

"Best methods of expanding sample data into estimates of totals for the State vary according to the items under consideration and the accuracy of the control data for that State. Suitable control data are available for Iowa but not for California and Florida. In those States it is almost necessary that sample surveys be designed so that they are independent of controls if suitable estimates of totals are desired."

An appendix, by Houseman, includes Mechanical Problems of Drawing a Stratified Random Sample of Grids.

Differentials in productivity and in farm income of agricultural workers by size of enterprise and by regions, L. J. DUCOFF and M. J. HAGOOD (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 54+, illus. 3*).—The basic data are limited to 1939 and, therefore, the findings are deemed preliminary and subject to review. The methods used in estimating agricultural employment; production expenses and net returns to labor, capital, and management; and the production costs and returns to labor and management for farms classified by total value of production, are described. Charts show gross and net returns per farm worker for the United States and the major geographic divisions and for the United States for farms classified by total value of products, and the cumulative percentage distribution of total value of agricultural products by type of product and value groups of farms. Tables are included and discussed showing by geographic divisions and the United States the total value of agricultural products and net returns to labor and management per farm worker; total value per farm and worker adjusted to the B. A. E. level and to include Government payments; comparison of value added by the agricultural production process with value added by manufacture; for farms classified by value of products, the total value of products and net returns to labor and management per worker; returns per farm and worker by value groups to labor, capital, and management; net farm income per farm operator family and family worker, and wage income per man-year of hired labor, comparable with total value of products; and net farm income per family and family worker and wage income per man-year of hired labor.

Net farm income and parity report, 1943, and summary for 1910–42 (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 29+*).—The income data in the mimeographed report entitled Material Bearing on Parity Prices (E. S. R., 89, p. 747) are brought up to date. Tables cover for 1910 to 1943 the total and per capita income of persons on farms and not on farms, income of persons on farms compared with national income, cash income from crops, livestock and livestock products, nonmoney income furnished by farms, production and hired labor expenses, value of farm property and farm debt, etc.

Introduction to postwar program for Idaho agriculture, ranges, and forests (*Idaho Sta. Cir. 91 (1944), pp.* [4]).—This is a proposal concerning local organization, leadership, programs, and literature necessary for the execution of post-war programs affecting the agriculture, ranges, and forests of the State.

Area analysis and agricultural adjustments for Ness County, Kansas, W. H. PINE, M. L. OTTO, and H. E. MYERS (*Kansas Sta., Agr. Econ. Rpt. 23 (1944), pp. 13+, illus. 1*).—A summary of the area analysis made to determine the agricultural adjustments that would lead to a higher standard of living.

Farm management association farms in the wartime production of Kansas agriculture, J. A. HODGES (*Kansas Sta., Agr. Econ. Rpt. 22 (1944), pp. 91+, illus. 1*).—"The Farm Management Associations are groups of farmers organized for the mutual benefit of members and for obtaining specific help along farm management, accounting, and marketing lines." The data were obtained largely from the records of over 400 cooperating farmers. Tables are included and discussed showing the acreage of selected crops and numbers of livestock in Kansas; yields; cash farm income; indexes of prices, volume, and income from marketing; average farm wages per month; and index of ratios of prices of specified livestock and livestock products and prices of feed. Comparisons are made between the association farms in different parts of the State and for different years and the results within the several type-of-farming areas.

Agriculture of the Kentucky Pennyroyal Plain, D. L. MacFarlane, E. J. Nesius, C. R. Sayre, and R. E. Graham. (Coop. U. S. D. A.). (*Kentucky Sta. Bul. 461 (1944), pp. 28, illus. 3*).—The farms in the area were classified by topography, size, and type of farming. Data as to the land use and crops in 1939 were obtained from agricultural conservation committee records and farm business analyses, and data as to farm practices were obtained from 175 farmers. The topography, soil, drainage, erosion, climate, changes in the agriculture, land tenure, labor utilization, and the marketing and transportation services of the area are described. The farms of the area, the cash returns from farming, and future opportunities for agriculture are discussed.

Commercial agricultural production and marketing methods and facilities in Mississippi, D. G. Miley (*Mississippi Sta. Bul. 394 (1943), pp. 94, illus. 26*).—The production and marketing of cotton lint, cottonseed, cattle, hogs, poultry, sheep, lambs, wool, dairy and poultry products, truck crops, fruits, nuts, other crops, and forest products in the State are analyzed and discussed.

Agricultural adjustments in New Mexico for wartime production in 1945, P. W. Cockerill. (Coop. U. S. D. A. et al.). (*New Mexico Sta. Press Bul. 991 (1944), pp. 10+*).—The desirable adjustments on dry-farmed, irrigated, and range lands; feed production and livestock numbers; and the effect of the labor, machinery, trucks, and the prices of products and land in production are discussed.

Wartime production and transportation of milk in the Shreveport area of Louisiana, W. H. Alexander (*Louisiana Sta. Bul. 378 (1944), pp. 22, illus. 4*).—Data for the year ended April 1943 were secured by interviews with 155 dairy farmers. Analyses are made of the location and size of the dairy business, number and types of routes, condition and utilization of trucks, organization of routes, factors relating to sustaining the production-feed situation, prices and subsidies, butterfat tests, and dairy farmer organization. Recommendations are made for improving the practices, routes, etc.

Factors affecting milk supply in Akron, Canton, Dayton, and Portsmouth, Ohio, C. G. McBride and R. W. Sherman (*Ohio Sta. Bul. 652 (1944), pp. 38+, illus. 5*).—This study of the changes that have taken place among producers shipping into four markets regularly is based on data for the years 1939–43 for Akron and Dayton, 1938–43 for Canton, and 1934–43 for Portsmouth. The changes in population, demand for and shipment of milk, number of cows, withdrawals and additions of shippers, etc., are discussed for each market.

Financial results of the operation of large sugar cane farms in Louisiana, 1939, 1940, and 1941, R. A. Ballinger (*Louisiana Sta. Bul. 374 (1944), pp. 19*).—This continuation of the study (E. S. R., 83, p. 261) is based chiefly on the records of 76 to 90 farms for the individual years. The average costs per farm, geographic variations; and relation of number of acres in cultivation and in cane, tons of cane sold, and yield per acre to financial returns are analyzed.

The average net costs of growing and harvesting per acre of cane and per ton of cane sold were: 1939, $78.56 and $3.70; 1940, $70.35 and $5.21; and 1941, $74.68 and $4.10. The average receipts in the respective years were: Per acre of cane, $83.94, $50.32, and $67.61; and per ton of cane sold, $3.95, $3.73, and $3.72. There was little or no consistent relationship between cultivated acreage and either yield of cane per acre or percentage of land in cane. Costs per ton of cane were highest for the farms with the smallest and the largest acreages of cane. Yields of cane per acre tended to be somewhat higher on the large farms. There was a consistent tendency for costs per ton of cane sold to decline with yield per acre.

Financial results of the operation of sugar mills in Louisiana, 1939, 1940, and 1941, R. A. BALLINGER (*Louisiana Sta. Bul. 373 (1944), pp. 18*).—Analysis is made of the data collected each year from 36 to 42 of the 45 to 50 mills in the State. A table shows by years per mill, per ton of cane, and per 100 lb. of sugar the overhead, cane procurement, sugar manufacture, selling and interest costs, the receipts from raw sugar and other products by items, and the total operating expenses, net operating income, net income, capital investment, and volume of cane ground and sugar manufactured. The geographic variations in cost and receipts and relation of size of mill, volume of cane ground, and yield of sugar to financial results are discussed.

The coordination of wheat and corn price controls, G. SHEPHERD (*Iowa Sta. Res. Bul. 330 (1944), pp. 341–372, illus. 8*).—Under present legislation and Commodity Credit Corporation rulings including the 1946 crop, the loan rates on wheat and corn are fixed at 85 percent of the 1909–14 parity. The effects of the continuation of such rates after the war on exports and the feeding of wheat to livestock are discussed. The following alternative plans are suggested: Keep the wheat loans at the present rate but reduce the production by about 150,000,000 bu. to the requirements for human food, a nominal amount for feed, and seed. Keep wheat at the present rates and subsidize feeding and exports. Reduce the wheat loan rate to about the same level in dollars and cents as the loan rate for corn, which, with the present rate on corn, would mean only 72.6 percent of parity for wheat. Use a loan rate for wheat inverse and proportional to the size of the crop. If the varying wheat rates averaged about 80 percent of the percentage of parity used for corn, the wheat loan rate would be about 10 percent higher in dollars and cents per bushel than the corn rate, and no subsidy would be necessary. The rate for wheat would be about 70 percent of parity.

Wheat-corn feeds, G. SHEPHERD. (Iowa State Col.). (*Flour & Feed, 45 (1944), No. 4, p. 14*).—A summarization of the above bulletin.

Response to price in production of cotton and cottonseed, R. M. WALSH. (U. S. D. A.). (*Jour. Farm Econ., 26 (1944), No. 2, pp. 359–372, illus. 3*).—During the period studied, 1910–43, the acreage response to the price of cotton adjusted for changes in prices paid by farmers for all commodities was on two distinct planes, the regression equation being $X_1 = 25.568 + 0.683X_2$ for 1910–24 and $X_1' = 33.238 + 0.888X_2'$ for 1925–33. The elasticity of response was approximately the same in both periods. The elasticity of supply for acreage varied from 0.1 to 0.3 at different levels of price. The first-difference analysis for 1911–33 showed that a 1-ct. change in price was followed by a change of approximately 880,000 acres. During periods of acreage control by the A. A. A., normal acreage-price relationships failed to hold. Changes in southern agriculture, such as further development of oil-bearing crops, feed, crops, and livestock, and possibly tobacco, may alter previous relationships.

The Minnesota farmer's interest in fats and oils, R. W. COX (*Minnesota Sta. Bul. 376 (1944), pp. 32, illus. 10*).—Tables and charts are included and discussed showing classes, production, trade, origin, and utilization of fats and oils of different kinds. More detailed discussion covers the production, exports, imports, domestic consumption, prices, consumer expenditures for lard and lard substitutes, butter, margarine, etc., and the utilization of fats and oils in soap, paints, varnishes, etc. The demand and supply situation and the outlets for fats and oils are described.

Sales of butterfat, including the butterfat equivalent of cream, whole milk, and farm butter, increased over 150 percent, of hogs nearly 300 percent, and of flaxseed over 400 percent from 1910–14 to 1940–43 and averaged 54 percent of the total farm income in Minnesota in 1940–43 as compared with 38 percent in 1910–14. In 1940–43 the State contributed about 20 percent of the butter, 7 percent of the lard, and 43 percent of the linseed oil originating in the United States. The output of oil from the 1942–43 production of soybeans was 1.7 percent of the total United States supply.

Foreign Agriculture, [August 1944] (*U. S. Dept. Agr., Foreign Agr., 8 (1944), No. 8, pp. 171–192+, illus. 4*).—An article, The Agricultural Potentialities of Manchuria, by R. T. Moyer (pp. 171–191) describes the natural factors affecting agriculture and the pre-war agriculture and discusses the agricultural potentialities. Another article, Australian Rural Reconstruction and World Markets (pp. 191–192), is included.

State and Federal lands in Michigan, J. W. STANNARD (*Lansing: Mich. State Planning Comm., 1943, pp. 40, illus. 6*).—The report was prepared as a source of factual material and presents and discusses data on State and Federal lands, tax-reverted lands, land use, tax sales and distribution of unsold lands, tax-abandoned lands, etc. It is supplemented by recommendations of the national planning and land use committees on public land control.

Rural land market activity in Mississippi, D. E. YOUNG, M. A. BROOKER, and F. J. WELCH. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 406 (1944), pp. 16, illus. 3*).—Using data for Covington and Washington Counties for 1941, 1942, 1943, and the first three months of 1944, the implications of inflated land values, the inflationary forces and tendencies, the trends in prices and value of sales, methods, and cost of financing, types of sellers and buyers, and land price control are discussed.

The increase from 1941 in prices of farm land varied in different sections of the State, but the State as a whole averaged slightly over 1 percent per month. The volume of sales increased materially, and farmers were the chief buyers and sellers. A large percentage of the sales were financed with mortgages for more than 50 percent of the sale consideration.

Buying a farm in Colorado, R. T. BURDICK, A. KEZER, A. M. BINKLEY, and R. C. TOM (*Colorado Sta. Bul. 485 (1944), pp. 15, illus. 3*).—Points requiring consideration in purchasing a farm or ranch in Colorado are brought out.

Report of the Farm Credit Administration, December 31, 1943 (*U. S. Dept. Agr., Farm Credit Admin., Rpt., 1943, pp. 27+*).—This interim report for the calendar year 1943 discusses the rise in land prices, the increase in loans made by the Administration, and the loans made by production credit associations, Federal intermediate credit banks, loans to farmer cooperative associations, and loans by Federal land banks and the Federal Farm Mortgage Corporation. Tables show the amounts of the loans and discounts made and outstanding by years, 1925–43; a combined statement of the condition of the production credit associations, December 31, 1942 and 1943; the Agricultural Marketing Act Revolving Fund; and a consolidated statement, December 31, 1942 and 1943, for the production credit corporations, Federal intermediate credit banks, banks for cooperatives, Federal land banks, the Federal Farm Mortgage Corporation, and the Regional Agricultural Credit Corporations (also April 30, 1934).

A specific-risk scheme for wheat crop insurance, F. H. SANDERSON (*Jour. Farm Econ., 25 (1943), No. 4, pp. 759–776*).—The essential feature of the plan presented is that loss payments and premiums are based on presumable losses computed from weather records.

Fire waste on Vermont farms: A preliminary report, T. M. ADAMS (*Vermont Sta. Pam. 9 (1944), pp. 12, illus. 7*).—Some of the findings in this study were:

During recent years farm property losses by fire have been approximately 1 percent of the value of the buildings; losses steadily increased from 1900 to 1931 and then decreased, being over 12 times as large in 1931 and 8 times as large in 1940 when they amounted to about $700,000; fire-insurance rates per $1,000 increased from $2.30 to $6.60; of fires for which the causes were known ($305,573 of the total loss of $682,708) 32 percent were caused by defective flues, 20 percent by lightning, and 13 percent by defective heating systems.

Use and cost of use of farm machinery, E. O. HEADY, J. A. HOPKINS, and E. G. MCKIBBEN. (Coop. U. S. D. A. et al.). (*Iowa Sta. Bul. P62 (1944), pp. 961–980*).—Analysis is made of data regarding the life, annual use, and annual costs of 25 of the more commonly used machines. The data covered approximately 3,000 farms and 38,083 machines and were obtained in August and September 1941 in cooperation with the Works Progress Administration. The life; annual service charges; depreciation; costs for interest, housing, insurance, and taxes; cooperative use of machinery; cost per unit of service; methods of reducing costs; etc. are discussed.

Cost of operating machinery on Nebraska farms, F. MILLER and W. L. RUDEN (*Nebraska Sta. Bul. 366 (1944), pp. 30, illus. 2*).—Beginning in 1940, data were obtained as to the original cost, life, average annual use, annual expenses for operation and repairs, and present value for different types and sizes of harvesting, land preparation and tillage, seeding, spraying, and miscellaneous equipment other than tractors. Tables show for each kind and size of machine the type of power used, original cost, annual use in acres and hours, and acres per hour; calculated and reported rates of accomplishing work; variations in costs per acre with different amounts of use; desirable size of machines for different amounts of annual use; representative costs; and costs per acre and per hour—use of machinery, power, labor, and preliminary preparation—with different types of equipment. The method used in computing costs and how the tables can be applied by farmers are discussed.

Trucking livestock in the Corn Belt region. (Coop. 13 expt. stas. and U. S. D. A.). (*Missouri Sta. Bul. 479 (1944), pp. 56+, illus. 9*).—This second bulletin (E. S. R., 89, p. 600) of the series based on the study of livestock marketing by the 12 Corn Belt States, Kentucky, Oklahoma, and the U. S. D. A. Bureau of Agricultural Economics (North Central Regional Publication No. 3) discusses the transportation problem; how livestock is transported to and from different types of markets; the trucking facilities—types, age, mileage, etc.; the efficiency of trucking—gross and net capacity, capacity v. actual load; practices in assembling, hauling, and use of trucks of appropriate size and type; return loads; diversion of shipments to rail, etc.; and makes recommendations for improving practices and efficiency.

Many trucks were operated inefficiently because of a lack of cooperation of farmers in assembling and hauling. Loads 100 percent of normal net capacity were carried by only 29 percent of the pick-up trucks, 39 percent of the standard trucks, and 54 percent of the semitrailers and truck-trailers. Loads of less than 50 percent of normal net capacity were hauled by 31, 16, and 4 percent, respectively, of the three types of trucks. Return loads were carried by 62, 55, and 39 percent, respectively, of the different types of trucks. Pick-up trucks constituted 4 percent of the trucks studied, standard trucks 83 percent, and semitrailers and truck-trailers 13 percent. The percentages of cattle received by truck at 68 public stockyards decreased from 70 percent in 1941 to 58 percent in 1943 and those of hogs from 70 to 67 percent. Calf and sheep shipments did not decline significantly.

Livestock auctions in Nebraska, H. C. FILLEY. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 369 (1944), pp. 16*).—The study is based chiefly on 80 fairly complete and 24 less complete schedules obtained in a survey made in 1941. The ownership, commodities sold, area, species and classes of livestock handled, types of buyers, equipment and facilities, sanitary regulations, commission charges, financial responsibility of companies, etc. are described.

Farmers' elevators of Ohio: Fifteen years, 1928 to 1943, B. A. WALLACE and J. I. FALCONER (*Ohio Sta. Bul. 650 (1944), pp. 29+ illus. 2*).—Used in the analyses were audit summaries of 119 to 151 companies each year, distribution of expenses based on data from 35 to 85 companies, average trading margins on different grains and farm supplies on data from 40 to 119 companies, and a study of the month-to-month trends of accounts receivable for 19 well-distributed companies. The companies are grouped into five groups on the basis of annual volume of business as follows: (1) Below $75,000, (2) $75,000 to $150,000, (3) $150,000 to $225,000, (4) over $225,000, and (5) companies operating more than one plant. The sections deal with amounts, sources of income, expenses, net gains, and the trends in the financial condition of Ohio farmer-owned elevators.

Volume of business, gross margins, grinding income (except for 1934–38), other income, and total income increased during each 5-yr. period, about half of the increase in volume of business being due to advanced prices and half to increased volume of grains and farm supplies handled. Trading margin in 1938 and 1939 averaged 83.2 percent of total income, increasing with each group from 79.1 percent for (1), to 84.3 for (4), and 85.2 for (5). The trading margins varied considerably from year to year, averaging 8.7 percent in 1928–29, 11.2 percent in 1932–33, and 8.9 percent in 1941–42, and for different groups, being 11.9 percent, 9.9, 9.6, 7.8, and 8.8 percent in the respective groups. Oats, corn, barley, and rye normally carried wider margins than wheat, and the margins fluctuated less and were less speculative due to the fact the four grains entered more largely into the local farm-supply trade. During the 15-yr. period there was a gradual reduction in interest paid, a general advance in reserves set up yearly for depreciation, and operating expense increased steadily except in 1931–34 and 1938–39. Allowance for uncollectible accounts remained fairly constant except in the depression years and the last year of the study. For 1940–41 operating expenses decreased from 11.2 percent for group (1), to 6.5 percent for group (4), and 7.6 percent for group (5); of total sales and other expenses from 13.4 percent to 7.4 and 8.8, averaging 7.7 and 8.9 percent. For the 15-yr. period the percentages of companies showing losses and gains were: Group (1) 37 percent and 1 percent, (2) 16 and 2.5, (3) 7 and 2.6, (4) 4 and 2.7, and (5) 15 percent and 2.5 percent. Of the average net gains 70.4 pecent was paid as patronage dividends or Federal income tax, and 29.6 percent was added to surplus. During the period the average surplus per company increased from $10,014 to $26,401 and the book value of stock per share from $138.60 to $187.73.

Cooperative marketing of rice and its part in the war emergency, H. M. BAIN (*U. S. Dept. Agr., Farm Credit Admin. Cir. C–129 (1943), pp. 46+, illus. 14*).—The production, harvesting, and warehousing in the United States and the marketing outlets, uses, transportation, wholesale distribution and distribution by trading areas, by types of concerns, and in packages are described. The organization, financing, operation practices, etc., of the American Rice Growers Cooperative Association, the Arkansas Rice Growers Cooperative Association, and the Rice Growers Association of California are discussed.

Year book of agricultural co-operation, 1941, edited by THE HORACE PLUNKETT FOUNDATION (*London: P. S. King & Son, 1941, pp. 296+*).—Included are the following special articles and reviews: Father Thomas Finlay—An Irish Co-operative Pioneer, by H. F. Norman (pp. 3–13); English and Canadian Schools, by H.

C. Fay (pp. 14–27); A Survey of the Colonial and Tropical Empire, by [C. R. Fay] (pp. 28–101); Canada—Report of the Horace Plunkett Foundation, by M. Digby (pp. 102–151); Newfoundland—Report of the Co-operating Division (pp. 152-181); The Co-operative Movement in Bengal, by J. P. Niyogi (pp. 267–272) and Agrarian China, by E. W. L. Holland (pp. 272–281), both reviewed by C. R. F[ay]; short notices (pp. 281–288); and communications from representatives in Wales, Australia, New South Wales, New Zealand, British Guiana, Union of South Africa, Kashmir, Ceylon, Palestine, Egypt, Iceland, Luxemburg, and Argentina.

Year book of agricultural co-operation, 1942, edited by THE HORACE PLUNKETT FOUNDATION (*Cambridge, Eng.: W. Heffer & Sons, 1942, pp. 293+, illus. 2*).—Part 1 includes the following articles and reports: A Memory of Horace Plunkett, by the Warden of All Souls (pp. 3–12); Co-operative Roads to a More Equal World—The Place of the Agricultural Movement, by P. Redfern (pp. 13–37); Agricultural Emergency Legislation in Great Britain, 1939–41 (pp. 38–63); Financial Policy in Agricultural Co-operation, by W. H. Jones (pp. 64–81); The Allotment Movement in England and Wales, by C. R. and H. C. Fay (pp. 82–130); Impington Village College (pp. 131–136); Agricultural Co-operation in the United States, by J. G. Knapp (pp. 137–171) (U. S. D. A.); Latin America, by J. Powell (pp. 172–192); Collective Farming in the U. S. S. R., by N. Barou (pp. 193–205); The Chinese Industrial Co-operatives (pp. 206–211); and England—Report of the Horace Plunkett Foundation (pp. 212–217). Part 2 includes communications from correspondents in Scotland, Wales, Ireland, Canada—the Western Provinces (1940–41), Western Australia, New South Wales, Union of South Africa, Nigeria, Federated Malay States and Straits Settlements, Cyprus, and British Guiana.

A survey of milk purchasing in Coshocton, Ohio, C. G. MCBRIDE and R. G. MCCORT (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 177 (1944), pp. 7+*).—Data were gathered by the Junior Women's Club in three surveys. Of 587 families in the first survey, the number purchasing on home-delivery routes only, at stores only, and not using the products were: Milk, 363, 152, and 17; cream, 140, 41, and 400; and butter, 87, 375, and 101. Eighty-one percent of the 402 families visited in the second survey were satisfied to continue alternate-day deliveries of milk after the war, and 84 percent of the 157 families in the third survey were willing to have only one grade (if 30 percent butterfat) continued for cream.

Milk distribution through stores in the Portland market, G. F. DOW (*Maine Sta. Misc. Pub. 574 (1943), pp. 32, illus. 1*).—This publication is based on the study previously noted (E. S. R., 91, p. 352) and includes much of the data noted therein. It discusses the types of stores, grades of milk and cream sold, sources and volume of milk and cream sold, daily and seasonal variations in sales, refrigeration facilities, milk returned to dealers, duplication of deliveries, etc.

The study indicates that most of the retail distribution of milk and cream could be handled fairly satisfactorily through stores and that considerable savings in the cost of distribution would be possible by eliminating excessive duplication of deliveries.

Newport city milk market, J. L. TENNANT (*Rhode Island Sta. Bul. 292 (1944), pp. 35, illus. 12*).—Analysis is made of data on demand for and receipt of milk by months, source of supply, sales, prices paid producers and charged consumers for Classes I and II milk, and other factors for the period 1934–43.

Consumption rose rapidly during the period and by 1943 was more than double that prior to 1940. During 1941 and 1942 production in the local milkshed was sufficient for demand, but during several months in 1942 and 1943, 40 percent was shipped from other milksheds. Adjustment of production to meet the July and August demand for fluid milk resulted in a large proportion of the milk produced in May and June, especially prior to 1941, being paid for at Class II prices and part of the capacity being unused during the winter. Large increase in the year-round population, transfer of some producers to other nearby markets, and unfavorable cost relationship caused some producers to reduce or discontinue production and were responsible for the extension of the producing area. Prices paid producers and charged consumers were fixed during the entire period by State or Federal agencies.

Livestock, meats, and wool market statistics and related data, 1943 (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, CS–8, pp. 104+*).—This handbook includes statistics on livestock on farms; livestock movements; federally inspected slaughter; cold-storage holdings of meats and lard; market prices of cattle, hogs, sheep, and lambs; hog-corn ratios; farm prices of livestock and wool; wholesale prices of meats, lard, and hides; retail prices of meats; index numbers of prices received by farmers and wholesale prices; average live and dressed weights, yields, and costs of livestock slaughtered; total cost, weight, and production of livestock slaughtered under Federal inspection; meat production and consumption; production and Boston prices of wool; meats graded and contract deliveries of meats, meat products, and byproducts; beef and veal graded; meats graded for the Commodity Credit Corporation; and meats and meat products processed under Federal inspection.

RURAL SOCIOLOGY

Some aspects of morale in a rural population, L. H. Stott. (Nebr. Expt. Sta.). (*Jour. Psychol., 17 (1944), No. 1, pp. 137–152*).—Self-ratings and ratings of parents on a set of nine wartime morale items were obtained from 544 rural adolescents, of whom 353 were children of farm families.

Morale in terms of willingness and readiness to do one's part in work and sacrifice to help win the war apparently was very high. A strong tendency was shown for the subjects to rate themselves and their parents similarly, but there were some interesting differences between self-rating and parent ratings. There was a tendency, particularly in the girls, to rate their fathers higher in interest in the progress of the war, concern about the management of the war effort, and faith and confidence in the National farm program, but they tended to rate themselves higher than their parents in hope for the future. Significant sex differences in percentage of "very strong"—"a great deal"—of ratings were found for five of the nine items. The girls tended more frequently to claim "a great deal of" hope for the future and willingness and readiness to work and sacrifice to help the cause of the war. Significant differences were also found between the farm subjects and those who lived in small towns in both self-ratings and parent ratings, further analysis showing that one sex or the other was almost completely responsible for each of these differences. Farm girls were peculiarly low in frequency of "very strong" ratings on belief in the cause, interest, and concern about the progress of the war and sympathy and accord with what is being done by our government to win the war. The town boys deviated similarly from the other group in faith in the National farm program, hope for the future, and willingness to work and sacrifice for the winning of the war. These preliminary results support the view that the "level of morale" in a given population varies with the particular aspect of morale being considered, and that the combination of factors determining each aspect is different. They indicate further that these different morale aspects may be expected to vary somewhat in level from one residence, or occupational group, to another, and from one sex and age group to another.

Establishing discharged service men and war workers on farms, O. R. Johnson (*Missouri Sta. Cir. 293* (*1944*), *pp. 11, illus. 1*).—This circular points out some of the essentials to success in establishing discharged service men and war workers on farms.

Let's talk about when Joe comes home and comes back to the farm (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, DS 24, pp.* [6]).—This is a pamphlet suggesting how the people should receive and aid the man and woman returning from war.

High school graduates in the first war year: A study of the after-commencement activities of 15,277 graduates from Washington high schools in 1942, P. H. Landis (*Washington Sta. Bul. 438* (*1944*), *pp. 16, illus. 4*).—The first war year found 34.3 percent of all the boys in school, as compared with 34.1 percent in 1934 and 31.4 percent in 1941. The proportion of all the girls in school was much less in the first war year than during the depression and during the pre-war years—32.1 percent in 1942, 38.4 percent in 1941, and 37.4 percent in 1934. Some 25 percent of rural boys were in school as compared with 37 percent of urban boys. The proportion of rural and urban girls in school was approximately the same in 1942, 31.7 percent of the rural as compared with 32.4 percent of the urban, although a much higher proportion of urban than rural girls went on to school prior to the war. The larger the community the higher was the proportion of boys in school. In communities under 250, 22 percent only were in school in 1942; in cities of over 100,000, 48.9 percent or more than twice as many. Agriculture drew a smaller proportion of rural young men in 1942 than at any previous time during the 9 yr. for which data were available, 1934–42, with the exception of the year 1941. In communities of under 250 population, 15 percent of the boys entered agriculture in 1942 as compared with 14 percent in 1941 and almost 28 percent in 1938.

Education of the farm population in Minnesota, L. Nelson (*Minnesota Sta. Bul. 377* (*1944*), *pp. 16, illus. 9*).—This study shows that Minnesota ranks above the national average in the proportions of school-age children attending school in all groups except farm youths over 15 yr. of age. In the proportions of 16- and 17-year-olds (native whites only) in the rural farm population attending school, Minnesota ranked second from the bottom among the 48 States in 1930 and seventh from the bottom in 1940. In the age group mentioned, the proportion of Minnesota farm boys attending school is lower than for the farm girls. The difference is greater than in any other State. Minnesota's rank among the States is next to the lowest for boys and thirty-first for girls. In the proportion of the adult farm population having any high school education, Minnesota ranks seventh from the bottom. A special study of eighth-grade graduates in five counties, 1931–39, indicates that the greater the distance the lower the percentage of the graduates who attend. This difference decreased from 1931 to 1939, probably as a result of improved transportation.

The Corn Belt family farm in an industrial area, O. R. Johnson (*Missouri Sta. Cir. 294* (*1944*), *pp. 15, illus. 6*).—This is a discussion of present day conditions confronting family farms in the Corn Belt, especially as influenced by industrial practices.

Health and human resources in rural Ohio, A. R. Mangus (*Ohio State Univ. and Sta., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul. 176* (*1944*), *pp. 61+*).—The author found that certain population trends and conditions are closely associated with the health situation and outlook. The increasing age of the population, the declining numbers and proportions of children, and increasing numbers and proportions of aged people and those in later adult years are among the reasons. A second factor is the differential reproduction rate. Those most favored in the social scale have not been reproducing themselves, while those occupying inferior social positions have been contributing disproportionately large numbers to the next generation. A third factor is the migration of farm youth to cities, generally selective of the better-educated youth who move to the cities. This loss of a large proportion of its youth leaves the typical farm community with an abnormal population structure and large numbers of people in the later years of life where health hazards are greatest. The final factor is the lack of adequate medical care and health services available to rural people. Reasons for this situation are lack of ability to pay the high costs of adequate medical care, to the widespread lack of understanding and appreciation of the nature and importance of good medical and dental care, and to the fact that the urban demand for doctors and medical facilities is so great as to drain the rural districts of those essentials to public health.

Medical care, needs, and plans for rural people in North Carolina: A series of newspaper articles, C. H. Hamilton (*Raleigh: N. C. State Col., 1944, pp. 10+*).—This is a discussion of the needs of the rural people of North Carolina for health and medical facilities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

General agriculture in the high schools of Iowa, J. A. Starrak and M. W. Kneedy (*Iowa Sta. Res. Bul. 327 (1944), pp. 185-232*).—"Information on the general characteristics of the courses offered, their subject matter, methods of instruction employed, qualifications of the teachers, and nature of teaching equipment was obtained from three sample groups of Iowa high schools involving 396 individual teachers in as many high schools and communities." The status of general agricultural instruction in high schools is discussed and the program evaluated. The courses, methods of teaching, training, qualifications of occupational experience, teaching load, professional activities other than teaching, attitude toward agriculture of the teachers, and the teaching equipment are discussed and recommendations made for ways to improve the instruction in general agriculture.

Among the recommendations suggested by the study and by teachers and superintendents were: Greatly increased minimum college work required in agriculture for teachers; the college preparation should include more economics, particularly agricultural economics, rural sociology, biology, and farm shop; more laboratory and field work; less reliance upon a single textbook and more extensive use of source materials; the course of study should give more emphasis to the agricultural problems and conditions of the State and local communities and the implications of national and international aspects for Iowa farmers; and more emphasis should be placed upon the development of appreciations of and interests in agriculture and rural life and less upon studies of the details of agricultural operations involved in crop and livestock production.

Selected list of American agricultural books (*U. S. Dept. Agr., Libr. List 1, rev. (1944), pp. 29*).—A revision (E. S. R., 87, p. 880).

FOODS—HUMAN NUTRITION

The microbiology of foods, F. W. Tanner (*Champaign, Ill.: Garrard Press, 1944, 2. ed., pp. 1196+, illus. 8*).—This book, intended as a source book to the literature as well as to the methods of analysis, is completely rewritten in the present edition (E. S. R., 69, p. 746) in order to cover recent advances in the science of bacteriology and especially its application to foods. The extensive literature citations are presented as footnotes in conjunction with the immediate text, and reference books on the subject under discussion are listed in each chapter. The present edition includes all major methods of analysis issued up to the time of publication. The scope of the work is indicated by chapters dealing with food preservation; the bacteria; yeasts and molds; bacteriology of water and sewage; fermented milks and other foods; meat and meat products; bacteriological milk analysis; pasteurization of milk; the microbiology (one chapter each) of cream and butter; cheese; frozen desserts, ice cream, and similar products; concentrated milks; fruits and fruit products; vegetables and vegetable products; tomato products; bread; sugar and sugar products; fish and shellfish; eggs and egg products; canned foods; and miscellaneous food products; intestinal microbiology; microbiological methods of assaying foods for vitamins; and culture media.

The nutritive value of Chinese fruits and vegetables, W. T. Wu (*U. S. Dept. Agr., Bur. Human Nutr. and Home Econ.,* [*1943*], *pp.* [*23*]).—This is a compilation of data on the proximate and mineral constituents and vitamin values of Chinese fruits and vegetables. It has been prepared (in limited edition) to serve as a handbook for use in planning and calculating dietaries used in China. Data are presented for 41 kinds of Chinese fruits and 89 kinds of vegetables designated by English, scientific, and Chinese names, the latter in Mandarin (North China) and Cantonese (South China). The sources used in compiling the data are listed.

Potato varieties purchased by North Dakota consumers, P. V. Hemphill (*North Dakota Sta. Bimo. Bul., 6* (*1944*), *No. 6, pp. 28–30*).—In the survey previously noted (E. S. R., 91, p. 611), information was obtained in the 1942–43 season from 60 North Dakota retail food-store managers concerning potato varieties preferred by North Dakota consumers. A tabulation of the varieties purchased in the several representative areas canvassed indicated that the Triumph and the Early Ohio varieties were the most popular, and that the Irish Cobbler, an important commercial variety for North Dakota, ranked surprisingly low. A large proportion (83 percent) of the potatoes handled by the food stores included in the survey was purchased from local producers.

Review of the literature on the nutritive value of soybeans, R. H. Barnes and J. E. Maack (*Minneapolis: Minn. Univ., Hormel Inst., 1943, pp. 63, illus. 6*).—This review deals with the content, composition, and nutritive value of the proteins of soybeans, the composition and nutritive value of the lipid fraction, the nature of the carbohydrate components, and the mineral and vitamin content. Over 200 references to the literature are cited.

Factors influencing the quality of cooked Jonathan apples, R. M. Griswold (*Michigan Sta. Tech. Bul. 195* (*1944*), *pp. 19*).—During winter storage of the apples the sauces became less desirable, with a weaker, more yellow color (as determined objectively by the Munsell system) and lower palatability scores. A correlation between hue and chroma figures for this series indicated that when the color of the sauce was yellowish it was likely to be less intense. Sauce from overripe apples was less yellow and more intense in color, while that from underripe fruit was yellower and less intense in color than that from fruit of standard ripeness. Sauce from standard apples was the most palatable. Soaking the sliced apples in weak brine improved the intensity and desirability of the color of the sauce but resulted in less desirable flavor than the standard sauce (prepared from unpeeled, uncored apples cooked till tender then sieved). Soaking in thiocarbamide or lemon juice improved the color of the sauce, making it less yellow and more intense. The thiocarbamide treatment did not affect the flavor, but treatment with lemon or pineapple juice resulted in a less desirable flavor in the opinion of the judges. Addition of citric, malic, or orthophosphoric acid to the prepared sauce improved color but not the flavor or general acceptability, while soda lessened the desirability with regard to color and flavor. Cooking in a pressure saucepan made sauce as good as or better than that from apples cooked in a covered pan; cooking in an open pan and steaming were less desirable methods. Increased contact with metal of the cooking utensils made the sauce yellower. Sauce made from apples cooked in sugar had a less yellow, more intense color, and was more attractive, but about the same in flavor and general acceptability as that to which sugar was added after straining. Addition of sugar at the beginning of the cooking process was wasteful, however, when unpeeled, uncored fruit was used.

Composition and uses of blueberries, F. B. CHANDLER (*Maine Sta. Bul. 428 (1944), pp. 21–39+, illus. 1*).—Data on proximate and mineral constituents and vitamin C content of blueberries and suggestions for their use are brought together from the literature (47 references), together with some previously unpublished data from the author's laboratory. The information presented on the utilization of blueberries is principally for use in the home. It is suggested, however, that the material on storage of blueberries, dehydration of blueberries, preparation of blueberry jelly, and construction of a fruit press for extraction of blueberry and other fruit juices may have possibilities for commercial adaptation.

Bacteriological studies of refined sugars on the retail market, J. WOLK and W. W. SMITH (*Food Res., 9 (1944), No. 2, pp. 115–120*).—Tests by National Canners Association methods to determine the bacteriological quality of 150 samples of beet and cane sugar, packed in 1- and 2-lb. paper, cloth, and cardboard containers and purchased at random in retail stores in Los Angeles, showed that the sugar was of high quality. Better than 95 percent of the samples passed the N. C. A. bacterial standards and over 98 percent the recommended tentative standards of Owen and Mobley. Aerobes or facultatively anaerobic thermophiles, including "flat sours," were present in 75 percent of the samples tested, although only 7 exceeded the N. C. A. standard. Counts of mesophilic bacteria showed that only 2 samples did not meet Owen's suggested standard for mesophiles. The cardboard cartons seemed to offer more protection from contamination than did other methods of packaging.

Spoilage of canned foods in Iowa, P. M. NELSON. (Iowa State Col.). (*Jour. Home Econ., 36 (1944), No. 3, pp. 136–138*).—In this survey of the extent of home canning and spoilage of canned products in the State in 1943, a random sample amounting to about one family out of every thousand in the State was secured, following a plan designed by G. W. Snedecor. The total of 618 families interviewed included 171 farm, 153 town, and 294 city families. Of the total of 129,222 qt. of canned foods reported, 1,848, or 1.43 percent, had spoiled. Corn led the list, with spoilage amounting to 38 percent of the total spoilage, followed by tomatoes 18, fruit 15, peas 14, beans 12, and others 3 percent. Reasons suggested by the homemakers for the spoilage are enumerated, the extent of food preservation in the State is discussed, and the needs revealed by the survey are pointed out.

Growth of a food-poisoning strain of alpha-type Streptococcus experimentally inoculated into canned foods, M. SURGALLA, M. SEGALOVE, and G. M. DACK (*Food Res., 9 (1944), No. 2, pp. 112–114, illus. 1*).—The organism used grew and survived for at least 30 days at 37° C. in canned foods of low-acid content (corn, peas), semiacid content (asparagus, spinach, string beans), a highly acid product (tomato juice), and in sea-food products (shrimp and salmon). Organisms were demonstrable in all cases for 60 days at 22° and at 37° in most instances. Growth did not occur in canned peaches, (a highly acid product), and viable organisms were not cultured after 2 days. Survival of the organisms in salmon and shrimp was significantly better than in fruits and vegetables.

A study of the diet and nutritional status of women in a low-income population group, J. C. WINTERS and R. E. LESLIE. (*Jour. Nutr., 26 (1943), No. 5, pp. 443–458*).—Duplicate samples of food consumed were collected during 1, 2, or 3 weekly periods from November to June from 24 women residents of three low-income housing projects in Austin, Tex., including Anglo-Americans, Latin Americans, and Negroes. The samples were analyzed for thiamine by the fermentation method; riboflavin, pantothenic acid, and niacin by microbiological methods; calcium by the A. O. A. C. method; phosphorus colorimetrically; and protein by the macro-Kjeldahl procedure. Bomb calorimeter determinations were made by J. Griswold on a number of food samples from each group. The subjects were examined for anatomical evidence of vitamin deficiencies by N. Jolliffe.

A comparison of the average daily intakes with the National Research Council allowances for sedentary women showed that the calorie intakes were from about one-half to three-fourths the allowance; the intakes of thiamine, niacin, and riboflavin slightly more than one-third; and protein, calcium, and phosphorus only about one-half the recommended allowances. The pantothenic acid intake was about one-fourth the amount that has been suggested as adequate. Seasonal and racial differences proved slight. No detailed report is given of the physical examinations beyond statements that few of the group were underweight and several were overweight, that no extreme cases of deficiency were observed, and that all cases did not show the same degree of deficiency on similar intakes. It is noted incidentally that "whether as a cause or result of the low-calorie intake, the restricted activity of the women is a factor worthy of comment. In general, their housekeeping standards were low and their outside activity negligible." However, in view of the absence of grave manifestations of malnutrition on the low intakes found and the failure to observe much underweight, the suggestion is made that possibly the recommended allowances are too high.

Prescribed diets for normal children, J. D. BOYD (*Jour. Ped., 24 (1944), No. 6. pp. 616–622, illus. 2*).—Two sample diets for a 10-year-old child labeled prevalent v. prescribed are compared with the National Research Council standard allowances for the same age. The foods for the prevalent and prescribed diets, respectively, consist of milk 2 glasses and 1 qt., egg ½ and 1, meat 75 and 100 gm., vegetables (2) ½+ and 1 cup, fruit 1 apple and 1 apple and orange, cod-liver oil none and 1 teaspoon, butter 30 and 30 gm., other fats 20 and 20 gm., bread (enriched) 6 and 4 slices, oatmeal large and medium servings, potato 2 and 1 servings, and sugar and sweets 75 and 75 gm. It is shown that the prescribed diet equals or excels the N. R. C. allowances in all the items considered, while the prevalent diet falls below the N. R. C. standard in calories, protein, vitamin A, ascorbic acid, and vitamin D; equals the standard in calcium and niacin; and exceeds it in iron, thiamine, and riboflavin (largely due to the liberal portions of enriched bread).

Special emphasis is given to the necessity of including meat in diet recommendations, not only for its protein but also for its iron and niacin content, and fish-liver oil for all except the child who regularly and predictably is exposed to direct sunlight in the midtemperate zone, and of meeting calorie requirements fully. The inclusion of 75 gm. of sugar in the recommended diet is justified as follows: "If the use of sugar and its products were prohibited, the child with boundless appetite might have little difficulty in completing his caloric needs through use of a reasonable substitute. Many other children would be less fortunate. If their caloric needs were not met fully, part of the ingested protein would be used for fuel rather than for tissue building. If the energy deficit were still greater, the child's own substance would be consumed to meet the need. Adequacy of protein and of calories are closely interrelated. Thus, it is important to make as ample provisions for caloric adequacy as for other factors in normal nutrition."

Diets of 524 high school girls, J. M. LEICHSENRING, E. G. DONELSON, H. H. DEINARD, M. S. PITTMAN, M. COOPRIDER, and V. HAGGART. (Minn. and Kans. Expt. Stas. et al.). (*Jour. Home Econ., 35 (1943), No. 9, pp. 583–586*).—This

7-day study was made in Minnesota and Kansas during the years 1939 and 1940, following the same plan as in the earlier study of college students reported by Reynolds et al. (E. S. R., 87, p. 592). The data are reported in percentages of the 524 diets containing stated numbers of servings per week from none to 21 or more of the more common food items, reported separately for the two States; and for 227 of the records the mean daily intakes with standard deviations of the essential nutrients by age (13–18 yr., inclusive) and the mean daily intakes of the same nutrients based on weight and age.

The food selections showed certain definite deficiencies, but in varying degree in the two States. More than 20 percent of the Kansas and more than 25 percent of the Minnesota girls ate no eggs during the 7-day period. Only a small number reported no servings of milk, but more than one-half of the Kansas and nearly one-third of the Minnesota girls consumed less than one serving of milk per day. Somewhat more than one-fourth of the Kansas girls and only one-tenth of the Minnesota girls reported less than one serving of meat a day. Almost 90 percent of the Kansas and more than 80 percent of the Minnesota girls reported less than one serving daily of green and yellow vegetables. Potatoes were served one or more times a day in only 43 percent of the Kansas families and more than 80 percent of the Minnesota families. Only 2 percent of the Kansas and 20 percent of the Minnesota diets contained one or more servings of other vegetables. Whole grain cereals were served less than once a day in 80 percent of the Kansas and 75 percent of the Minnesota diets. Citrus fruits and tomatoes were served less than once a day in 75 percent of the Kansas and 65 percent of the Minnesota diets, but other raw fruits brought up vitamin C consumption to adequate levels.

The mean daily intakes of the different nutrients were surprisingly constant for the different age groups. The weighted means were calories 2,285, protein 69.8 gm., calcium 0.78 gm., phosphorus 1.25 gm., iron 12.2 mg., vitamin A 5,982 International Units, thiamine 1.164 mg., ascorbic acid 81 mg., and riboflavin 1.622 mg. In comparison with National Research Council standards for girls 13-18 and 16-20 yr., the calories, protein, and calcium were definitely low. Iron intakes were inadequate according to the standard, but some question was raised as to the actual inadequacy. Very high standard errors for vitamin A suggested that although the mean intake was adequate some individuals must have had much less than the standard allowance. Ascorbic acid and thiamine were considered adequate and riboflavin inadequate. There was a progressive decrease in the nutrient intake per kilogram with increasing age, the greatest decrease occurring during the period of most rapid weight gains.

This is the twenty-first paper from the regional nutritional status project of the North Central States (E. S. R., 90, p. 129).

A comparison of diets of school children in New York City in 1917 and 1942, C. J. Evans and R. Lubschez (*Jour. Ped., 24 (1944), No. 5, pp. 518–523*).—Series of records of the daily diets of comparable groups of New York City school children in 1917 and 1942 were compared by selecting from each group a random sample of 100 records of children between the ages of 10 and 12 yr. and calculating the percentages of the children having stated portions of each article of food. From the average number of servings of the various foods per child per day, calculations were made of the average protein, fat, and carbohydrate content, caloric intake, and content of certain vitamins and these values were compared with the recommended daily allowances of the National Research Council.

The most striking changes in the consumption of the different items of food were increased consumption of milk and citrus fruits in 1942 and decreased consumption of tea and coffee. No significant differences were found in the consumption of meat, fish, cheese, and eggs; a decrease in cereals and bread; and an increase in desserts such as cake, pies, and puddings, but a decrease in sugar, jams, jellies, and candy. Among the vegetables there was an increase in tomatoes and in both quantity and variety of green vegetables. The calculated average intakes of certain food constituents in 1917 and 1942 and the corresponding recommended allowances are, respectively, protein 78.2, 79.2, and 70 gm.; calories 2,115, 2,029, and 2,500; calcium 0.4, 0.7, and 1.0 gm.; vitamin A 5,166, 8,897, and 4,500 International Units; thiamine 896, 1,167, 1,200 µg.; vitamin C 50.1, 118.4, and 75 mg.; riboflavin 1.7, 2.0, and 1.8 mg.; and niacin 14, 12, and 12 mg.

It is concluded that the dietary habits of the present generation in the school population studied show a definite improvement, which is attributed largely to the influence of public health education although partly to greater availability of fresh fruits and vegetables. It is pointed out that the consumption of protective foods, particularly those containing vitamin C, is probably not adequate and that further emphasis is needed, particularly as to the comparative nutritive values of different foods and preferred methods of cooking. The need for school lunches, even for children who are not considered to be underprivileged, is considered apparent.

The stature of Toronto children half a century ago and today, H. V. and E. M. Meredith (*Human Biol., 16 (1944), No. 2, pp. 126–131*).—A comparison of data collected in 1892 on the heights of elementary school children in Toronto, Canada, with similar data on comparable groups in the same city in 1939 is reported and discussed.

At the age of 6 yr., the typical elementary school child in Toronto was no less than 5.0 cm. (2 in.) shorter in 1892 than in 1939 and the increase in height in the later period was characteristic of both males and females, although slightly greater for the females. At 9 yr., the differences were even greater, averaging approximately 7.5 cm., and were similar in magnitude for males and females. The greatest differences in the two periods were at the ages of 12 or 13 yr. for the females and 13 or 14 yr. for the males, when the differences amounted to 9 cm. for the girls and slightly less for the boys. At 14 yr., the oldest age studied, the average difference was reduced to approximately 6 cm.

It is also noted that still another survey of Toronto children made in 1923 gave results roughly intermediate between the 1892 and 1939 data.

The nutritive value of protein.—I, The effect of processing on oat protein, R. A. Stewart, G. W. Hensley, and F. N. Peters, Jr. (*Jour. Nutr., 26 (1943), No. 5, pp. 519–526*).—Four oat products processed by different commercial procedures, as well as home-cooked oatmeal, were tested for their relative protein quality by a rat-growth method. The test materials were incorporated in the basal ration, containing 0.5 percent protein, in amounts sufficient to bring the total protein (N × 6.25) to 10 percent of the total ration. The protein efficiency calculated from the gain in body weight per gram of protein consumed was not reduced by subjecting the oatmeal to ordinary home cooking, by precooking of oat flour by the drum dried process (as in a commercial precooked baby food), or by toasting an extruded oat flour product. Processing by means of the explosion technic, as applied in the preparation of certain oat products, resulted in damage to the quality of the oat protein.

Field peas as a source of protein for growth, E. Woods, W. M. Beeson, and D. W. Bolin. (Idaho Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 4, pp. 327–335*).—Weight gains, over an 8-week period, of rats fed raw Alaska field peas (*Pisum sativum*) as the sole source of protein, with and without supplementations with methionine or cystine, were compared with gains of animals receiving casein at the same protein level (10 percent protein). Methionine was apparently the limiting factor, since supplementing the raw pea diet with 0.3–0.9 percent methionine caused a fourfold increase in weight gain and almost halved the amount of food required per gram of weight gained. Baking and autoclaving the field peas decreased the growth-promoting properties of the protein, although the food intake of the rats did not change. The addition of cystine to the autoclaved peas permitted a rate of growth comparable to that on the diet containing raw peas. Rats fed the raw pea protein (10 percent level) plus 0.3 percent methionine as the sole source of protein made 47 percent more gain and required 25 percent less food per unit gain than rats fed casein at the 10 percent level. "Apparently the Alaska field pea is an excellent source of the amino acids essential for growth, with the single exception of methionine."

Creatine and creatinine metabolism, H. H. Beard (*Brooklyn, N. Y.: Chemical Pub. Co., 1943, pp. 376+, illus. 6*).—This monograph critically reviews the experimental work on creatine and creatinine metabolism published in recent years, more particularly the last 15 yr., with applications wherever possible to human metabolism and to diseases of the muscles and heart. The metabolism of these compounds is discussed in relation to other metabolic processes, including carbohydrate metabolism, muscular contraction, phosphate bond energy, phosphorylation and respiration, physical fitness, nutritional muscular dystrophy, the vitamins, hormones, etc., and creatine-creatinine metabolism in the myopathies and diseases of the heart. Detailed instructions are presented for the determination of creatine and creatinine in body tissues and fluids by the newer technics. An extensive bibliography is given, and author and subject indexes are provided.

Corn oil and butterfat essentially equal in growth-promoting value, L. P. Zialcita, Jr., and H. H. Mitchell. (Univ. Ill.). (*Science, 100 (1944), No. 2586, pp. 60–62*).—In extension of the somewhat controversial literature on the relative nutritive value of butter and other fats (E. S. R., 89, pp. 757–760), both paired feeding and ad libitum feeding experiments on young rats in a comparison of butterfat and corn oil are summarized. "These studies indicate that, apart from differences in vitamin content, corn oil and butterfat are essentially equal in growth-promoting value for the rat."

Diet in relation to hepatic physiology and pathology: A review of pertinent data, F. C. Mann (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 8, pp. 560–566*).—This review of recent literature is presented under the headings: Diet in relation to hepatic function, diet in relation to pathologic conditions of the liver, vitamins and the liver, and protein and the liver. In addition to 16 references to the literature cited in the text, a number of references are appended to relevant articles on the functions of the liver; fatty liver, diet, etc.; and hepatic injury associated with dietary deficiency.

Observations on a diet deficient in both methionine and cystine in man, A. A. Albanese, L. E. Holt, Jr., J. E. Brumback, Jr., J. E. Frankston, and V. Irby (*Bul. Johns Hopkins Hosp., 74 (1944), No. 5, pp. 308–312, illus. 1*).—Two healthy male subjects placed on a diet deficient in methionine and cystine developed negative nitrogen balances shortly after institution of the doubly deficient diet. After 36 days on the diet, the nitrogen equilibrium was quickly restored by addition of a supplement of methionine alone (18.8 mg. *dl*-methionine per kilo), suggesting that methionine is capable of furnishing the entire requirements of man for sulfur amino acids.

Ferritin.—VI, Conversion of inorganic and hemoglobin iron into ferritin iron in the animal body. Storage function of ferritin iron as shown by radioactive and magnetic measurements, P. F. Hahn, S. Granick, W. F. Bale, and L. Michaelis (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 407–412*).—Iron in the form of ferric ammonium citrate when administered by vein to the dog was found to be readily converted into ferritin iron in the liver. Iron derived from hemoglobin of the circulating red blood cells following the destruction of the cells by acetylphenylhydrazine was in part, at least, converted to ferritin iron in the liver and spleen. The body was able to convert injected ferric iron of the form containing five unpaired electrons, as in ferric ammonium citrate, to ferric iron of the form containing three unpaired electrons, characteristic of ferritin. It is concluded that ferritin iron acts in the capacity of storage iron in the animal body.

Bibliography on metals in foods and biological materials.—VIII, Thallium, J. H. SINGER (*Analyst, 69 (1944), No. 819, pp. 185–186*).—These references supplement the series noted earlier (E. S. R., 87, p. 453) and bring the bibliography up to date.

Compilation of recent data on mineral and vitamin values of foods, R. C. CLOUSE (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 7, pp. 496–504*).—This extension of an earlier compilation (E. S. R., 89, p. 769) covers the period from May to December 1942, inclusive. The list of 49 references to the literature includes 20 reporting experiment station research.

Saving minerals and vitamins in fresh vegetables and fruits, O. SHEETS (*Mississippi Sta. Bul. 407 (1944), pp. 14, illus. 5*).—This bulletin, based largely on the results of experiment station research, particularly that of the Mississippi and other southern experiment stations, points out how vitamins and minerals may be conserved in fruits and vegetables by choice of those storage conditions and cooking procedures shown to cause the smallest vitamin losses in holding the foods after harvest and in preparing them for table use. For further conservation, emphasis is given to careful trimming and selection of edible portions to conserve vitamin-rich parts frequently discarded as, for example, the outer green leaves of cabbage and lettuce, and the pulp of the orange, discarded if the juice is strained.

The role of vitamins in energy transformations, V. R. POTTER (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 7, pp. 488–491, illus. 3*).—This discussion of the interrelationship of vitamins and enzymes, with particular emphasis on energy transformations, is illustrated by schematic diagrams showing the relationship between food and life, the metabolic reactions involving energy transformations, and the mechanism of muscular contraction. Reference is made to unpublished work from the author's laboratory.

Vitamin content of spray-dried whole egg, A. A. KLOSE, G. I. JONES, and H. L. FEVOLD. (U. S. D. A.). (*Indus. and Engin. Chem., 35 (1943), No. 11, pp. 1203–1205, illus. 1*).—Emulsified whole eggs and the spray-dried egg powders prepared from them were obtained from several commercial egg-drying plants and subjected to vitamin analyses by methods noted. Analyses reported on the dry basis for 20 samples before and after spray drying showed that this process as practiced in most of the commercial drying units had no significant destructive action on the vitamins contained in the egg, namely, vitamins A and D, thiamine, riboflavin, pantothenic acid, and nicotinic acid. Data obtained on one sample held in storage in barrels, except for one set of subsamples stored in sealed tins, showed that vitamin A was unstable during storage of the dehydrated eggs, 60, 75, and 80 percent being lost after 9 mo. at the storage temperatures of 15°, 70°, and 98.6° F., respectively. The pantothenic and nicotinic acids were quite stable in the 9 months' storage at these temperatures. Only slight destruction of riboflavin occurred at 98.6° during the 9 mo. and essentially none at lower temperatures. Thiamine in spray-dried whole eggs was stable at 15° for 9 mo., but 46 and 50 percent was lost in this period at the temperatures of 70° and 98.6°, respectively.

The ratio of ascorbic acid, riboflavin, and thiamine in raw and pasteurized milk, A. D. HOLMES, C. P. JONES, A. W. WERTZ, and J. W. KUZMESKI. (Mass. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 4, pp. 337–345*).—"The ratios to each other of ascorbic acid, riboflavin, and thiamine have been determined for winter milk produced under controlled conditions by the college herd of Ayrshire, Guernsey, Holstein, Jersey, and Shorthorn cows. The vitamin contents of the milk were determined for samples taken just previous to and immediately following pasteurization by the holding process for 30 min. at 143°-145° F.

"The ascorbic acid content of the raw milk ranged from 14.0 mg. to 22.5 mg. and averaged 19.7 ± 0.18 mg. per liter; after pasteurization in stainless steel equipment, the extreme values were 7.0 mg. and 19.1 mg., with an average value of 15.9 ± 2.7 mg. per liter.

"The riboflavin content of the raw milk varied from 1.35 mg. to 1.75 mg. and averaged 1.51 ± 0.09 mg. per liter. The corresponding riboflavin values for the pasteurized milk were 1.19, 2.06, and 1.48 ± 0.01 mg. per liter, respectively.

"The thiamine content of the raw milk varied from 0.29 to 0.35 mg. and averaged 0.33 ± 0.02 mg. per liter. Corresponding thiamine values for the pasteurized milk were 0.21, 0.34, and 0.30 ± 0.03 mg., respectively.

"The raw milk contained 4.6 ± 0.3 times as much riboflavin as thiamine, 13.1 ± 1.43 times as much ascorbic acid as riboflavin, and 59.8 ± 6.40 times as much ascorbic acid as thiamine. On the average, the pasteurized milk contained 4.9 ± 0.81 times as much riboflavin as thiamine, 11.0 ± 1.93 times as much ascorbic acid as riboflavin, and 53.8 ± 9.63 times as much ascorbic acid as thiamine."

Uniformity of riboflavin content of milk produced under standardized conditions, A. D. and J. O. Holmes. (Mass. Expt. Sta.). (*Amer. Jour. Diseases Children, 66 (1943), No. 6, pp. 607-610*).—The results of the riboflavin assays of 80 lots of 800 qt. of milk are reported. The milk was produced by a normal healthy mixed herd (Ayrshire, Guernsey, Holstein, Jersey, Shorthorn) maintained under modern dairy conditions on a winter ration composed of hay, corn silage, grass silage, beet pulp, mangels (December only), and grain. The samples of milk, collected for analysis after 1 mo. on the winter ration, were obtained during December, January, February, and March and represented mixed morning and afternoon milks, handled from milking through analysis in a manner to exclude light. The riboflavin content, determined fluorometrically, averaged in milligrams per liter 1.45, 1.50, 1.49, and 1.46 in each of the 4 mo., respectively, and 73, 86, 88, and 94 percent of the samples came within 10 percent of the respective monthly average. The range of values for the 800 samples was from 1.13 to 1.75. "These results seem to justify the conclusion that it is possible to standardize the feeding and management conditions for a dairy herd sufficiently so that milk of relatively uniform riboflavin content may be produced for considerable periods of time."

Ascorbic acid, riboflavin, and thiamine content of cow's milk: Influence of the ration, A. D. Holmes, C. P. Jones, and A. W. Wertz. (Mass. Expt. Sta.). (*Amer. Jour. Diseases Children, 67 (1944), No. 5, pp. 376-381*).—A review of some 40 references to the literature indicated that investigators were not in agreement concerning the influence of a cow's ration on the amount of ascorbic acid, riboflavin, and thiamine in the milk. A study was made, therefore, of these vitamins in the milk from a mixed herd of 69 cows (referred to in the above study) maintained under controlled, standard feeding and management practices. The study was made as the cows were being transferred from the winter ration of hay, silage, and ground grain (period 1) to green grass pasture ration (period 2, April 26 to May 10; period 3, May 11 to June 17). The results of the assays, reported in detail, showed that the vitamin values, in milligrams per liter, averaged 20.3, 1.43, and 0.32 for ascorbic acid, riboflavin, and thiamine, respectively, in period 1; with corresponding values of 19.1, 1.26, and 0.32 in period 2; and 19.5, 1.46, and 0.34 in period 3. The decreased levels of ascorbic acid and riboflavin associated with the change to green pasture were accompanied by increased milk production, which decreased again slightly in period 3; the average amount of milk produced daily during the three periods was 12.6, 13.6, and 12.9 l. per cow. When the vitamin production was calculated as the average daily production per cow the values for ascorbic acid, riboflavin, and thiamine became 255.6, 18.0, and 4.0 mg., respectively, in period 1; 259.0, 16.9, and 4.3 mg. in period 2; and 251.1, 18.8, and 4.4 mg. in period 3. These results are interpreted to indicate that early pasture is not superior to a properly produced, well-selected winter ration.

Effect of pasteurization on the riboflavin content of milk, A. D. Holmes. (Mass. Expt. Sta.). (*Jour. Amer. Dietet. Assoc., 20 (1944), No. 4, pp. 226–227*).—Mixed morning and evening herd milk produced under controlled feeding and management conditions by five breeds (Ayrshire, Guernsey, Holstein, Jersey, and Milking Shorthorn) of normal healthy cows was pasteurized by the holding and by the flash process. Riboflavin, determined by the fluorescence method in a semidark laboratory, averaged 1.46 mg. per liter before and 1.43 mg. per liter after pasteurization in the spray vat equipment (24 samples); 1.52 mg. per liter before and 1.49 mg. per liter after pasteurization in the coil vat equipment (12 samples); and 1.41 mg. per liter before and 1.42 mg. per liter after pasteurization by the flash process. These results indicate that the consumer can be assured that he will obtain essentially as much riboflavin from recently pasteurized milk, under the conditions described, as he would from the same raw milk just before pasteurization.

Distribution of vitamin A in tissue as visualized by fluorescence microscopy H. Popper (*Physiol. Rev., 24 (1944), No. 2, pp. 205–224*).—This review presents a brief historical introduction, outlines the method of determining vitamin A in tissue by fluorescence microscopy, and considers the evidence for the specificity of vitamin A fluorescence, the stability of the fluorescence, and the influence of carrier substances on this property. The vitamin A distribution in different organs under normal and pathological conditions as determined by the fluorescence technic is reviewed. The review, based on 149 literature references, is summarized as follows: "The microscopic visualization of vitamin A by fluorescence permits the study of its distribution in organs. In various physiologic and pathologic conditions the distribution undergoes characteristic changes, not indicated by chemical analysis or bio-assay. Conclusions as to the role of vitamin A in the body can be made which are not arrived at by other methods. The histologic method, which permits only a rough but quick estimation as to the quantity of vitamin A present, does not substitute for the chemical analysis but supplements it. The fluorescence microscopic demonstration of vitamin A, however, not only aids in the investigation of the vitamin A metabolism but also presents a new histologic method for the differentiation of lipides independent of the biologic significance of the fluorescence."

The bodily store of vitamin A as influenced by age and by food, A. B. Rohrer and H. C. Sherman (*Jour. Nutr., 25 (1943), No. 6, pp. 605–609*).—In studies similar to but more extensive than those reported by Kao and Sherman (E. S. R., 85, p. 565), offspring of rat families on diets otherwise similar but furnishing, respectively, 3, 6, and 12 International Units of vitamin A per gram of air-dry food were killed at 30 or 60 days and their muscle and liver tissues analyzed for vitamin A by the single feeding method of Sherman and Todhunter. "Whether compared at the age of 30 or 60 days, the vitamin A in the liver was found to have been decidedly influenced by the level of nutritional intake of this vitamin. The skeletal muscles of the same animals showed differences in the same direction, but so small as to be of doubtful statistical significance. Storage of vitamin A in the body, as reflected by the concentration in the liver, was found to have continued in the second age period studied when the level of nutritional intake of the vitamin was high, but not when it was near the minimal-adequate level."

The vitamin A value of dehydrated sweetpotatoes and carrots, F. I. SCOULAR, J. E. BALLEW, C. J. CARL, and V. DOZIER (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 6, pp. 428–430*).—Vitamin A was determined by biological assay by a slight modification of the procedure of Swanson et al. (E. S. R., 80, p. 277). Commercial, pulverized dehydrated sweetpotatoes of the Porto Rico variety ("Vita Yam") obtained in 1940 and 1941 assayed, respectively, 119 and 126 International Units of vitamin A per gram. Storage of the 1940 dehydrated product for the year resulted in a reduction of the vitamin A value to 99 I. U. per gram. A sample from sweetpotatoes of this variety harvested in 1939 and not dehydrated until June 1940 contained 135 I. U. per gram. Pulverized commercially dehydrated carrots assayed 197 I. U. vitamin A per gram.

The in-vitro destruction of carotene by water extracts of minced rat stomachs in the presence of methyl linolate, E. L. HOVE. (Ala. Polytech. Inst.). (*Science, 98 (1943), No. 2550, pp. 433–434*).—This paper offers a possible explanation of the observation of Sherman (E. S. R., 86, p. 422) that carotene administration to vitamin A-deficient rats is inactivated by the simultaneous feeding of methyl linolate through the demonstration that carotene can be rapidly destroyed in vitro by a clear water extract of minced rat stomachs in the presence of methyl linolate.

Vitamin B-complex studies on dehydrated meats, E. E. RICE and H. E. ROBINSON (*Food Res., 9 (1944), No. 2, pp. 92–99*).—Vitamin contents of pork and beef were determined at various stages of commercial dehydration which involved precooking of large lots of boned, cubed meat in steam-jacketed kettles, followed by grinding and drying in warm air in a rotary drier; with pork the procedure was modified to provide for separate concentration of the broth, which was drawn off and skimmed to remove fat, the concentrated broth and such fat as was desired being later reincorporated with the dehydrated pork. Thiamine was determined by the thiochrome procedure of Connor and Straub (E. S. R., 87, p. 9), and riboflavin, niacin, and pantothenic acid were determined microbiologically upon samples which had been enzymatically hydrolyzed. Vitamin values for the raw, cooked, and dehydrated meat, and, in the case of the pork, for the aqueous broth, the concentrate, the fat, and the finished product are reported, together with estimates of vitamin losses. Losses in beef were estimated from the vitamin values per gram of protein; in pork, retentions were computed on a "total" basis, with due allowance for the broth and the fat. The dehydrated beef retained 76 percent of the thiamine, 105 percent of the riboflavin, 92 percent of the niacin, and 68 percent of the pantothenic acid of the raw meat. Dehydrated pork retained 63 percent of the thiamine, 104 percent of the riboflavin, 92 percent of the niacin, and 73 percent of the pantothenic acid of the raw meat. The 100+ values for riboflavin were consistently obtained, and are attributed to the formation of stimulating substances during the cooking. Storage losses of thiamine in dehydrated pork were found to be extensive at temperatures of above 80° F.

Rice and the vitamin B complex, V. R. WILLIAMS and E. A. FIEGER (*Louisiana Sta. Bul. 381 (1944), pp. 8*).—Data based upon analyses of 100 rice samples obtained in the 1942–43 milling season from 13 Louisiana mills and 1 Arkansas mill are reported for thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, and inositol in brown rice of the Blue Rose, Early Prolific, Nira, Rexoro, American Pearl, and Fortuna varieties. Data are also reported for the milled fractions, first-break, second-break, brushed, and finished rice, and rice bran and rice polish of the varieties Blue Rose, Fortuna, and Early Prolific. The vitamin content of the rices decreased with increased milling in going from the brown to the polished form. The byproducts, rice bran and rice polish, were excellent sources and the brown rice a good source of all these B vitamins except riboflavin. The brown rice lost from 66 to 87 percent of its vitamin content in the milling process. The several varieties showed no outstanding differences in the vitamin content, although the long-grain rice, Nira, and Fortuna, ranked highest. The Rexoro, Blue Rose, and Early Prolific varieties held an intermediate position, and the shortest-grain variety, American Pearl, was lowest. These results are in agreement with the fact that the long-grain varieties have more surface per volume and hence a greater area of bran layers. In the present report (E. S. R., 91, p. 487) all values are calculated as micro-ounces per pound.

Rice as a source of B vitamins, V. R. WILLIAMS and E. A. FIEGER. (La. State Univ.). (*Rice Jour., 47 (1944), No. 5, pp. 5–6, 13–15, illus. 1*).—Essentially noted elsewhere (E. S. R., 91, p. 487).

Losses of B vitamins due to cooking of foods, V. H. CHELDELIN, A. M. WOODS, and R. J. WILLIAMS (*Jour. Nutr., 26 (1943), No. 5, pp. 477–485*).—In extension of earlier work by Lane et al. on the cooking losses of thiamine (E. S. R., 88, p. 414), the present investigation was concerned with losses in riboflavin, nicotinic acid, pantothenic acid, biotin, inositol, and folic acid in about 30 foods, including vegetables, fruits, milk, and eggs. The vitamins were determined by microbiological assay methods applied to extracts prepared by digestion of the foods with takadiastase and papain. The details of cooking, the weights of the samples and the vitamin values (expressed as micrograms per total sample) before and after cooking, and the calculated losses are tabulated.

Riboflavin losses during the cooking were greatest in the presence of light; large losses (up to 48 percent for eggs and milk and up to 33 percent for pork) were incurred upon cooking in an open pan. In the dark, i. e., in a covered pan, riboflavin losses were negligible. Nicotinic acid losses were generally slight, although pork loin samples lost from 32 to 75 percent upon being fried and some of the vegetables from which the cooking water was discarded lost from 27 to 61 percent. Pantothenic acid losses were slight in vegetables, but somewhat larger (up to one-third), in meats. The loss in biotin was negligible to moderate in vegetables (0 to 28 percent), but quite high in meats (up to 72 percent). There was no loss of biotin in fried eggs. In cooking meats inositol losses were generally only moderate or even slight in steamed samples; in vegetables, however, losses were often very great, amounting in legumes to as much as 95 percent. Cooking losses of folic acid were very great for most foods.

Studies in the average American diet.—II, Riboflavin, nicotinic acid, and pantothenic acid content, V. H. CHELDELIN and R. R. WILLIAMS (*Jour. Nutr., 26 (1943), No. 4, pp. 417–430*).—In extension of an earlier report (E. S. R., 88, p. 414), this paper presents the results of riboflavin, nicotinic acid, and pantothenic acid determinations in individual foods and estimates the amounts of these vitamins in a 2,500-calorie diet composed of these foods. The diet, planned as one typical of the average American diet consumed by the middle two-thirds or three-fourths of the population prior to the use of enriched bread and flour, was estimated to contain 1.4 mg. riboflavin, 11 mg. nicotinic acid, and 4.9 mg. pantothenic acid per 2,500 calories. It is pointed out that these values are appreciably lower than the most generally supposed daily requirements. "Enrichment of bread and flour to meet prevailing standards increases the level of riboflavin 12 percent to 1.6 mg.; that of nicotinic acid, 53 percent to 17 mg. The principal contributors of these vitamins to ordinary diets are as follows in the order of their importance: For riboflavin, milk, white bread, eggs, potatoes, and liver; for nicotinic acid, beef, lean pork, fish, white bread, and potatoes; for pantothenic acid, white bread, milk, eggs, and potatoes. Tables are presented to permit the calculation of vitamin contents of other diets."

Skin temperatures of the extremities of persons with induced deficiencies of thiamine, riboflavin, and other components of the B complex, G. M. ROTH, R. D. WILLIAMS, and C. SHEARD (*Jour. Clin. Invest., 23* (*1944*), *No. 3, pp. 373–379, illus. 4*).—In connection with the series of studies on thiamine deficiencies by Williams and associates (E. S. R., 90, p. 566), measurements of the loss of vasomotor tonus were made and correlated with the clinical signs and symptoms of thiamine deficiency, apparent degree of depletion of tissue stores, and severity of metabolic changes. Under the carefully controlled conditions of the investigation, "none of the subjects of induced thiamine, riboflavin, or vitamin B complex deficiency showed any degree of vasomotor disturbance as evidenced by measurements of skin temperature and determination of rates of cooling and warming of body tissue. When due consideration was given to the basal metabolic rate, the skin temperatures of the extremities under varying conditions were within the normal range. Furthermore, skin temperatures of the extremities of these subjects, measured at the height of the state of deficiency and following the administration of vitamins, showed a closer correlation with the basal metabolic rate than with the state of vitamin deficiency."

The effect of thiamine, riboflavin or pyridoxine deficiency on the intestinal absorption of galactose in the rat, J. R. LEONARDS and A. H. FREE (*Jour. Nutr., 26* (*1943*), *No. 5, pp. 499–508*).—By the same methods followed in earlier studies (E. S. R., 91, p. 101), it has been shown that the rate of intestinal absorption of galactose by pair-fed litter-mate control rats averaged 66 percent more than that of thiamine-deficient rats and 12 percent more than that of pyridoxine-deficient rats. Riboflavin deficiency had no effect on galactose absorption.

The biological assay of pyridoxine (vitamin B_6), M. F. CLARKE and M. LECHYCKA (*Jour. Nutr., 25* (*1943*), *No. 6, pp. 571–584, illus. 2*).—The method described, which has been developed and tested in the authors' laboratory, involves increase in weight with graded doses of the vitamin. Reasons are given why the curative procedure was not adopted, and data are reported on which were based the selection of supplements and the conclusions as to the sensitivity and specificity of the procedure.

Riboflavin and thiamine interrelationships in rats and in man, J. W. FERREBEE and N. WEISSMAN (*Jour. Nutr., 26* (*1943*), *No. 5, pp. 459–469, illus. 1*).—The suggestion of Sure and Ford (E. S. R., 89, p. 504) that thiamine deficiency, by affecting riboflavin retention and utilization, may be of clinical significance in the production of riboflavin deficiency in man led to an examination with this possibility in mind of data collected during the course of another investigation. The data include experiments on rats in which the concentration of both thiamine and riboflavin in livers and kidneys during a period of thiamine deficiency were compared with those in control animals receiving either unautoclaved yeast or thiamine as a supplement to the deficient diet. Measurements were also made of riboflavin and thiamine excretions in control and deficient rats under varying conditions. In experiments on man, determinations were made on autopsy material of the content of riboflavin and thiamine in various tissues of three presumably normal individuals who had met accidental death and three in presumably poor nutrition who died of natural causes. Urinary thiamine and riboflavin excretion values were obtained on a small group of patients of varying nutritional status.

The observations reported failed to confirm the conclusion that thiamine deficiency per se has any effect on riboflavin metabolism. Changes in the riboflavin metabolism of rats were observed only in the terminal stages of thiamine deficiency and are thought to be related to the rapid metabolism of tissues when the thiamine requirement can be met only by tissue loss. In the human data, no relation was found between thiamine and riboflavin in the tissue analyses and excretion tests.

It is pointed out that, "in patients whose vitamin nutrition is generally 'poor,' the necessity for distinguishing riboflavin deficiency due to inadequate riboflavin intake from riboflavin deficiency due to a presumed relationship to thiamine deficiency is at once apparent." In the authors' opinion, the patients with evidence of both riboflavin and thiamine deficiency were suffering from inadequate intakes of both of these vitamins.

Stomatitis due to riboflavin deficiency, H. EVERLEY JONES, T. G. ARMSTRONG, H. F. GREEN, and V. CHADWICK (*Lancet* [*London*], *1944, I, No. 23, pp. 720–723*). —Stomatitis yielding rapidly to treatment either with riboflavin (100 mg. in 5 days) or fresh yeast (½ oz. daily) was observed in 1,746 of 10,313 soldiers in a military camp in North Africa. The condition developed about 2 mo. after the daily riboflavin intake at the camp had been reduced from an average of 1.61 mg. to about 1 mg. per man daily and was not abolished when the intake was raised to 1.28 mg. It cleared up when milk, meat, and eggs were added to the diet.

The tongue lesions, which are described in detail, were studied with a slit lamp.

The effects of inanition and riboflavin deficiency upon the blood picture of the rat, C. F. SHUKERS and P. L. DAY. (*Univ. Ark.*). (*Jour. Nutr., 25* (*1943*), *No. 6, pp. 511–520*).—This investigation was suggested by the earlier observation of Day et al. (E. S. R., 75, p. 426) that attempts to produce cataract in monkeys on diets somewhat similar to those producing cataracts in rats resulted in leucopenia and anemia. Two series of studies were made of the hematology of rats on cataract-producing diets, one conducted in 1933 before riboflavin deficiency was established as the factor responsible for cataract and the other in 1940 after this discovery made it possible to maintain the inanition controls on experiments for as long a time as the deficient animals survived. Data are reported on both series. In the second series, in which the data are more clear cut, the animals were maintained from weaning on a diet deficient in riboflavin but adequate for good growth with regard to all other nutritive factors. One group received the diets ad libitum, the second ad libitum with a 120-µg. supplement of riboflavin twice weekly, and the third in amounts equivalent to the food consumption of the animals of the first group and the same amount of riboflavin as the second. Hemoglobin determinations, total erythrocyte and leucocyte counts, and differential counts made at frequent intervals revealed similar changes in the blood picture in the first and third groups, indicating that the changes noted were probably the result of inanition and not of riboflavin deficiency.

The assay of vitamin B_1 in New Zealand materials by the thiochrome method, D. I. ALLEN (*Jour. Nutr., 25* (*1943*), *No. 6, pp. 521–537*).—This report includes data on the thiamine content of New Zealand flours, breads, and breakfast foods and on the assessment of thiamine nutrition in a group of male medical students by urinary excretion methods.

As determined by the thiochrome method, a composite New Zealand whole wheat flour contained 4.30, a composite white flour 2.00, and a sample of Dunedin whole wheat flour 5.27 µg. of thiamine per gram. Breads made from flours of 100, 80, and 70 percent extraction gave values of 2.61, 2.37, and 1.28 µg. per gram, respectively. Of 25 breakfast cereals tested, oatmeal and wheat meal which had undergone little processing proved to be good sources of thiamine, but most of the precooked ready-to-eat cereals were low in this vitamin.

Of the 39 medical students participating in the second part of the investigation, 9 lived in their own homes, 18 in college residences, and 12 in different lodgings. As thus classified, the average 24-hr. thiamine excretions of these groups amounted to 188 (or 156 with one exceptionally high value omitted), 157, and 90 µg., respectively. The low values obtained for the third group living in cheaper lodgings is thought to reflect the poor diets available. Five subjects, 2 living at home, 1 in a college residence, and 2 in lodgings, were also tested before and after receiving a test dose of 1 mg. of thiamine. The percentage returns of this test dose amounted to 13, 9, 9, 4, and 3 percent, respectively.

Subclinical vitamin deficiency.—IV, Plasma thiamin, M. H. Carleen, N. Weissman, and J. W. Ferrebee (*Jour. Clin. Invest., 23 (1944), No. 3, pp. 297–302, illus. 1*).—Evidence is presented indicating that plasma thiamine may be determined with a satisfactory degree of accuracy by (1) determining the yeast-stimulating activity of plasma by the yeast fermentation method of Schultz et al. (E. S. R., 88, p. 293) and recording it in terms of thiamine equivalence, (2) destroying the yeast-stimulating activity due to thiamine in the plasma by the sulfite cleavage technic of Schultz et al. (E. S. R., 85, p. 727), and (3) calculating the true thiamine by subtracting the results of (2) from (1). Dialysis experiments showed that at least 80 to 90 percent of the yeast-stimulating materials of the plasma is freely diffusible at pH 5 to 7 and hence, in vivo, probably is in free exchange with similar materials, notably thiamine, in the general extracellular fluids. This observation is important in lending support to the idea that changes in plasma thiamine concentration may be taken as an index of changes in the thiamine content of the general cellular environment.

The yeast-stimulating activity of plasma was found to vary with the level of thiamine nutrition, with the level of thiamine excretion, and with the true plasma thiamine concentration.

The methylation of nicotinamide by rat liver in vitro, W. A. Perlzweig and M. L. C. and F. Bernheim (*Jour. Biol. Chem., 150 (1943), No. 2, pp. 401–406*).—"Rat liver slices when incubated with nicotinamide at 37° were shown to synthesize *N*¹-methylnicotinamide (F_2). This process is strictly aerobic, requires unbroken cells, and is usually, but not always, enhanced by the addition of methionine. Liver slices do not methylate nicotinic acid. Rat kidney and muscle do not exhibit, in vitro, the capacity to methylate nicotinamide. Suggestive evidence is presented to indicate that the individual variations in the rate of excretion of *N*¹-methylnicotinamide in the urine of rats are possibly related to the rate of methylation of nicotinamide in their livers."

The performance of normal young men on controlled thiamine intakes, A. Keys, A. F. Henschel, O. Mickelsen, and J. M. Brozek. (Univ. Minn.). (*Jour. Nutr., 26 (1943), No. 4, pp. 399–415, illus. 2*).—In this extensive investigation, the results of which are presented only as averages and examples, the criteria emphasized in considering thiamine requirements were: "(1) Ability to do brief severe work of the type that is largely anaerobic; (2) ability to do moderately prolonged work of a severity close to the maximum at which a relatively steady state can be maintained; (3) ability to carry out various tasks of psychomotor function involving speed and coordination; and (4) ability to maintain normal carbohydrate metabolism, including its intermediary details."

The subjects were four normal young men (college students) who were kept on each experiment for 10–12 weeks. The diet was adequate except for thiamine and was adjusted to 3,050 ± 200 Calories per day. The thiamine intakes as determined by thiamine analyses of all foods averaged for the different periods 0.63, 0.53, 0.33, and 0.23 mg. per 1,000 Calories. In addition, two control periods were run in which the subjects received 1 mg. of thiamine daily. All subjects followed a fixed regime of work of various types, the nature of which is described together with the general and clinical observations.

"All results are in agreement that, for the periods studied, no benefit of any kind was observed to be produced by an intake of more than 0.23 mg. of thiamine per 1,000 Calories. At this level of intake muscular, neuromuscular, cardiovascular, psychomotor, and metabolic functions were in no way limited by the thiamine restriction. Clinical signs, subjective sensations and state of mind, and behavior were likewise apparently unaffected by thiamine intakes from 0.96 to 0.23 mg. per 1,000 Calories. From the present work, no conclusions are drawn as to requirements for men during more prolonged periods or for women, children, the aged, or for states of disease or injury."

The role of "folic acid" and biotin in the nutrition of the rat, A. D. Welch and L. D. Wright (*Jour. Nutr., 25 (1943), No. 6, pp. 555–570*).—This report describes the identification of two factors, folic acid and biotin, which must be supplied to the rat to permit good growth and development when succinylsulfathiazole is incorporated in a synthetic ration adequate in the well-recognized dietary essentials for the species. These two factors have already been shown by Black et al. (E. S. R., 88, p. 854) and Nielsen and Elvehjem (E. S. R., 89, p. 505) to overcome the growth inhibition produced by succinylsulfathiazole. Supplementing a ration containing succinylsulfathiazole with biotin and folic acid concentrate also decreased the prolonged prothrombin time of the rats to values approaching those of normal animals or of animals given a grass juice supplement high in vitamin K.

It is thought that at least part of the effect produced by these factors is to promote a certain type of bacterial synthetic activity, although both might be involved in the utilization of vitamin K by the rat. "Concerning biotin, the sum total of all available evidence is suggestive of a direct role of this factor in animals; in the case of folic acid preliminary evidence supports the same conclusion."

The role of "folic acid" and biotin in the utilization of pantothenic acid by the rat, L. D. Wright and A. D. Welch (*Science, 97 (1943), No. 2523, pp. 426–427*).—Rats fed a sulfonamide such as sulfaguanidine or succinylsulfathiazole in purified diets as noted above frequently developed signs of marked pantothenic acid deficiency, such as achromotrichia and porphyrin-caked whiskers. In microbiological assays of the liver for pantothenic acid content, values of 40–50 µg. per gram were obtained instead of values of 80–90 µg. per gram found in the livers of rats on a complete diet or a highly purified diet without sulfonamide. Further increase in the pantothenic acid of the diet or subcutaneous administration of pantothenic acid was without effect. Supplementing the purified diet with dried grass (5 percent) in addition to succinylsulfathiazole (2 percent) raised the pantothenic acid content of the liver to values intermediate between normal levels and those produced on the basal diet without the added sulfonamide and restored growth to a rate comparable to that of rats on the basal diet. The oral administration of crystalline biotin (5 µg. daily) for a period of 3 weeks caused a slight increase in the pantothenic acid content of the liver and some improvement in growth. The further addition of 20 mg. daily of folic acid concentrate prepared by the method of Hutchings et al. (E. S. R., 88, p. 175) not only restored growth but also raised the pantothenic acid content of the liver to normal levels.

"An attractive hypothesis suggests that in the absence of folic acid and biotin, PA [pantothenic acid] cannot be utilized by the organism. Whether the influence of these trace factors on PA utilization results from an effect on the synthesis of PA derivatives by intestinal bacteria, from an effect on the synthesis of such derivatives by the tissues of the rat, or from other effects, has not yet been established."

Ascorbic acid content of white potatoes as affected by cooking and standing on steam-table, R. M. Kahn and E. G. Halliday (*Jour. Amer. Dietet. Assoc., 20 (1944), No. 4, pp. 220–222*).—The potatoes were prepared, cooked in various ways, and held for serving in a large hospital where facilities were comparable to those in commercial cafeterias. Ascorbic acid was determined by the 2,6-dichlorophenolindophenol method adapted for use with an Evelyn photoelectric colorimeter. Carefully selected paired samples were analyzed in the raw and the cooked state. Weights of raw and cooked samples (the latter after cooking and after standing) were ascertained to permit computation of the values in the cooked samples to the raw basis. The raw mature potatoes, representing samples of different varieties and origin, contained from 3.6 to 14.0 mg. ascorbic acid per 100 gram.; Louisiana new potatoes contained from 51 to 61 mg. per 100 gram. Steaming in the skins was the only method of preparation which resulted in no loss of ascorbic acid. French-fried potatoes showed a small loss when the temperature of the fat was kept constant. It is pointed out that ordinarily there is great variation in temperature during this cooking process and that potatoes so prepared cannot be considered a reliable source of ascorbic acid. Baked potatoes lost 20 percent of their ascorbic acid during baking and this loss increased to 59 percent after 43 min. on the steam table. Potatoes pared, cut in halves or sixths, and baked without added fat or salt lost 20 percent during baking, and this increased to 48 percent after 38 min. on the steam table. Mashed potatoes and creamed potatoes lost 39 percent of their ascorbic acid during the steaming and 95 percent after preparation and standing on the steam table.

Effect of refrigeration on ascorbic acid content of canned fruit juices after opening, F. I. SCOULAR and H. WILLARD (*Jour. Amer. Dietet. Assoc., 20* (*1944*), *No. 4, pp. 223–225*).—A total of 57 cans, varying in capacity from 6 to 46 oz. and representing 19 commercial brands of canned fruit juices, was obtained in local grocery stores in Denton, Tex., from March to July 1943 and opened for analysis of the contents in June and July. Ascorbic acid, determined by the dye titration method, in the nine brands of grapefruit juice, four of orange, two of pineapple, and four of apple juice averaged, respectively, in the freshly opened juices, 29.9, 34.6, 9.8 and 1.7 mg. per 100 gm. These juices were stored, after opening the cans, on the top shelf of a refrigerator operated under home-use conditions where the temperature varied from 7° C. in the early morning to 22° late in the afternoon. Each juice was stored in three ways, namely, in the can covered with an oiled-silk refrigerator dish cover, in the open can, and in a glass jar with the lid but no rubber. The ascorbic acid lost by each of the canned fruit juices during the refrigeration was found, however, to be similar for the three methods of storing. After 1 day of refrigeration, the average percentage loss of ascorbic acid from the freshly opened cans was 3.0 for grapefruit, 3.7 for orange, 1.1 for pineapple, and 24.1 for apple juice. The grapefruit juice was also sampled after several days of refrigeration, and lost only 5.6 percent of its ascorbic acid even after 3 days.

Synthesis of vitamin C in stored apples, C. WEST and S. S. ZILVA (*Biochem. Jour., 38* (*1944*), *No. 1, pp. 105–108, illus. 1*).—Vitamin C was found to be synthesized in Bramley Seedling apples during storage at 3°; the capacity for such synthesis diminished with age of fruit.

The ascorbic acid requirements of school-age girls, V. M. ROBERTS, M. H. BROOKES, L. J. ROBERTS, P. KOCH, and P. SHELBY (*Jour. Nutr., 26* (*1943*), *No. 5, pp. 539–547, illus. 1*).—In this extension of an earlier investigation (E. S. R., 88, p. 862), 30 preadolescent girls between the ages of 6 and 12 yr. living in a suburban home for girls served as subjects. Preliminary determinations of the food intakes of 6 of the subjects for a week showed daily ascorbic acid intakes ranging from 31 to 94 mg. and averaging 59 mg. Blood ascorbic acid levels of these subjects ranged from 0.46 to 0.97 mg. per 100 cc. Readjustments were made in the diet to lower the ascorbic acid content to about 22 mg. daily, most of this being contained in the noon meal. The girls were divided into 6 groups and were given daily supplements of ascorbic acid in amounts increasing by 10 mg. in each group from 10 mg. to 60 mg. The amount of reduced ascorbic acid in the blood plasma was determined weekly, and at the end of the third period the urinary excretion of ascorbic acid was measured before and after a test dose of 300 mg. Blood levels of 0.7 mg. per 100 cc. and an excretion of 50 percent of the 300-mg. test dose within 24 hr. were the indices used to indicate satisfactory vitamin C nutrition.

On a total ascorbic acid intake of 42 mg. or below, using 22 mg. daily as the average ascorbic acid content of the diet, neither criterion was met. On 52 mg., 1 subject maintained a blood level above 0.7 mg. and 3 excreted 50 percent of the test dose. On 62 mg., all but 1 maintained a blood level of 0.7 mg. by the third period and excreted 50 percent of the test dose. All of the subjects in the groups receiving 72 and 82 mg. of ascorbic acid daily were in a good state of vitamin C nutrition. All had higher values at the end of the third period than during the first, the mean blood levels were above 0.7 mg., and all but 1 excreted more than 50 percent of the test dose. On the basis of these findings, it is concluded that 62 to 72 mg. of ascorbic acid would be an adequate allowance for preadolescent girls from 6 to 12 yr.

TEXTILES AND CLOTHING

A method of estimating shrinkage, length, fineness, and price of wool from lock samples, P. E. Neale (Coop. U. S. D. A.). (*New Mexico Sta. Bul. 315 (1944), pp. 19, illus. 17*).—Small locks of wool about twice the size of a finger taken at random from every fifth fleece in herds of 1,000 or more sheep were found representative of the entire clip in dirt content, fineness, and length. In herds of 500 to 1,000, locks from every third fleece were needed; from 100 to 500, from every second fleece; and in herds of 100 or fewer, a lock from every fleece. The locks were easily divided into definite groups according to dirt content as represented by different degrees of penetration of the dirt, shown by illustrations. Large wool samples from the same herd as the locks were separated into groups with the same degree of dirt penetration as the locks. Wool thus divided was scoured and shrinkage determined for each degree of dirt penetration. Average actual shrinkage of the whole clip of wool was calculated from combined shrinkages of dirt groups from the large wool samples. Using the number of locks falling into each dirt group and shrinkage determined for each dirt group from the large samples, an estimated shrinkage was calculated by multiplying number of locks in each dirt group by actual shrinkage found for that group, adding products of these multiplications, and dividing by the total number of locks in all groups. Estimated shrinkage was then compared with the actual shrinkage, to find the difference.

In 4 of the 17 tests of wool from 17 groups of range sheep by the method described above, representing about 300,000 lb. of wool, the estimated shrinkage differed by —1.41, —1.32, —1.50, and —1.18 percent, respectively, from the actual. Four had a difference between 0 and 0.25 percent; 2, a difference between 0.25 and 0.5 percent; 7, a difference between 0.5 and 0.75 percent; and 1, a difference between 0.75 and 1.0 percent. Average length of wool calculated from the locks was essentially the same as that calculated from representative wool samples. Locks also proved excellent for determining the average fineness of the clip. Inexperienced persons could use this method, and in 2–3 hr. a close estimate could be made of the shrinkage of the wool from as many as 10,000 sheep.

Service tests on blends of new and reclaimed wool, H. M. Ward and B. Bailey. (S. Dak. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 5, pp. 290–294*).—The work summarized here has been reported elsewhere in greater detail (E. S. R., **86**, p. 570; **90**, p. 716).

Introducing the "Grex," R. O'Brien. (U. S. D. A.). (*Jour. Home Econ., 35 (1943), No. 10, pp. 637*).—This article defines the Grex and explains briefly what it is and why it is being introduced. It is a new word coined to name the unit upon which is based the new proposed system for numbering yarns. The name is derived from "grams per 10 kilometers" (GRams pEr X), and the Grex would be the weight in grams of a 10-km. length (10,000 m.) of yarn. "Some of its advantages are that it could be used in numbering all kinds of yarns (eliminating the many confusing systems now in use) and that it is based on the metric system which is much easier to use in calculations. It is a direct system, giving higher yarn numbers for heavier yarns."

Compression meter for evaluating the compressibility and resilience of fabrics, E. C. Dreby (*Amer. Dyestuff Rptr., 33 (1944), No. 10, pp. 199–204, illus. 2*).—The compression meter, described as to construction, operation, and calibration and illustrated by photograph and diagram, was devised for evaluating the compressibility of soft-finished, light-weight fabrics under pressures of 0.05–0.50 lb./in.^{2} It utilizes the combined pressures of a liquid column and air under pressure, this being transmitted to the test specimen through a very thin rubber membrane. Thus low pressures are distributed relatively uniformly over the test area. The results of compression meter measurements are presented for a series of cotton percales, 100 × 56 cotton fabrics, and spun rayon fabrics. A comparison of these results with the hand, or feel, of the fabrics as judged by a group of textile experts indicated that the compressibility affects directly the feeling of "thickness." By combined results of measurements of compressibility and flexibility a measure of "fullness" was obtained. The comparison meter may also be used to evaluate compressional resilience.

Thermal properties of moist fabrics, C. W. Hock, A. M. Sookne, and M. Harris (*Amer. Dyestuff Rptr., 33 (1944), No. 10, pp. 206–219, illus. 21*).—"The 'chilling effect' or 'clamminess' which moist fabrics produce when in contact with the body was evaluated by subjective tests, by measurement of the drop in temperature which ensues when the moist fabrics are placed on an artificial 'skin' surface, and by tests with a moisture-sensitive paper designed to measure the extent of contact which the fabrics made with a surface. Using fabrics of various fiber compositions and constructions, a good qualitative relation was found in these tests. Fabrics which produced considerable chilling in subjective tests were found to make good contact, and to cause a substantial drop in skin temperature. Conversely, fabrics which caused little or no clamminess made poor contact, and the accompanying drop in temperature was relatively small. The results of these experiments show clearly the progressive improvement of the fabrics with respect to chilling as their wool content is increased, and also the superiority of certain types of construction which minimize the extent of contact of the fabrics with the skin."

The analysis of 33 qualities of unbleached muslin, G. B. Frankenberg and M. B. Hays. (U. S. D. A.). (*Jour. Home Econ., 34 (1942), No. 10, pp. 737–741, illus. 2*).—The 33 materials used in this study were obtained as representative qualities from all large manufacturers and included five classes in which there were grades of muslin suitable for a variety of household purposes. These muslins were tested in accordance with standard methods of the American Society for Testing Materials, except that sizing was removed by a modified procedure previously used by G. R. White,[1] and involving immersion of the samples in carbon tetrachloride for 2 hr. at room temperature, drying, rinsing in boiling water, immersion in an enzyme solution for 1 hr., and finally boiling in distilled water for two 30-min. periods.

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[1] Jour. Home Econ., 34 (1942), No. 1, pp. 42–50, illus. 4.

The tabulated results of the laboratory tests indicate that fabrics varied in weight from 2.25 to 5.32 oz., with the majority weighing between 3.0 and 4.5 oz. In general, there was a relationship between weight and count, the latter varying from 40 × 40 to 68 × 72. The amount of sizing varied from 6.0 to 11.6 percent, with an average of 8.8 percent. Thickness ranged from 0.0135 to 0.0204 in., with an average of 0.0158 in.. The maximum residual shrinkage for these muslins varied from 5 to 12 percent (average 8 percent) lengthwise, and from 4.9 percent to 9 percent (average 7 percent) crosswise. It is pointed out that these amounts are high enough to affect the fit of a garment or make several inches difference in the size of a sheet, so that unbleached muslin should be laundered before making it into any article where fit is important. A comparison between strip and grab methods of determining breaking strength was made with samples paired so that the same set of yarns was tested by both methods. A close correlation was observed between results of the two tests, with the average grab breaking strength of all 33 fabrics approximately 6 lb. more than the strip breaking strength. Calculating strip values from grab values and vice versa by the formula of Mereness gave results which tended to be too high for grab values and too low for the strip values, in comparison with experimental values.

Plain-weave cotton dress fabrics: Analysis of six types, M. B. HAYS. (U. S. D. A.). (*Jour. Home Econ., 35 (1943), No. 6, pp. 363–366*).—The 57 fabrics tested included lawn, dimity, dotted swiss, gingham, shantung, and poplin; 15 were obtained on the Washington, D. C., market in 1935 and tested at that time, and 42 were bought, largely from cooperative, mail-order, or chain stores, and tested between 1939 and 1941. The sampling and testing procedures were similar to those employed in the above study. The lawn, dimity, and swiss with a woven dot weighed less than 2 oz. per square yard, and swiss with a composition dot somewhat more. Filling values, which were generally lower than warp values by both the grab and strip methods, were below 20 lb. for the 22 samples of lawn, dimity, and swiss, indicating that these samples would not be expected to be serviceable for purposes requiring a high breaking strength. Loss of weight on desizing was not more than 5.3 percent for this group of fabrics, indicating that they were manufactured with the addition of relatively little finishing material. The light-weight lawn, dimity, and swiss, in general, shrank more in the filling direction (4.0 to 11.5 percent) than in the warp (1.3 to 5.4 percent); the 21 ginghams, varying from tissue ginghams to coarse playcloth fabric, ranged in weight from 1.63 to 4.67 and averaged 3.23 oz. Warp count was somewhat higher than filling. Warp breaking strength (grab method) was more than 20 lb. in most samples, loss in desizing ranged from 0.9 to 21 percent, and shrinkage in the warp (greater than in the filling direction in most of the ginghams) varied from about 3 to 12 percent. Poplins and shantungs (heavier than the majority of the ginghams tested) had approximately twice as many warp as filling yarns per inch, resulting in the characteristic ribbed effect. These fabrics, with minimum warp and filling breaking strength (grab method) of 47.6 and 20.4 lb., respectively, were stronger as a group than lawn, dimity, swiss or gingham, and should prove serviceable when high breaking strength is required in use. Loss in weight on desizing the poplins and shantungs ranged from 1.3 to 10.4 percent, and all but 3 of the fabrics shrank at least 3 percent in the warp or filling or in both directions.

"As a result of this study it is recommended that quality of lawn, dimity, swiss, gingham, shantung, and poplin be defined in terms of minimum weight, count, and breaking strength and maximum amount of finishing material. The colorfastness and maximum shrinkage of a given fabric should also be stated, so that the purchaser can handle it with due regard for these characteristics. By defining these properties it will be possible to peg quality to price."

Hosiery labeling, M. SMITH. (U. S. D. A.). (*Jour. Home Econ., 36 (1944), No. 2, pp. 89–92, illus. 11*).—This paper outlines in chronological order the developments leading to the present hosiery labeling regulation. As the regulation now stands, one stocking of each pair must bear a label, transfer, insert, or ticket giving the maximum ceiling price and the gauge or needle count for that type of stocking. No mention is made of grade labeling, but the hose must meet minimum specifications (for plain-knit full-fashioned and circular-knit hose) set up in W. P. B. Limitation Order No. 274, and can carry the trade-mark, brand name, or O. P. A. registration number of the manufacturer or wholesaler. Since standards of inspection are included in the regulation, all hose are graded uniformly. Some of the qualities in hose assured by these minimum specifications, such as those for length, welt, heel, toe, colors, and denier, are presented.

Serviceability of full-fashioned cotton hose: A study of hosiery knit with various toe reinforcements, M. B. HAYS and M. C. BOYER. (U. S. D. A.). (*Jour. Home Econ., 36 (1944), No. 1, pp. 35–37*).—"Ten doz. pairs of nurses' white cotton hosiery of each of three lots were put into service in a Washington hospital. These hose, knit from 120/2 SxP variety American-Egyptian cotton, differed only in the toe reinforcement yarn. The average time of discard for the three lots of hose was 19.4 days. If the experiment were repeated, the probability is 90 percent that this average would not be in error more than 5 percent (1 day).

"The hose made with the toe reinforcement of two ends of 80/2 and one end of 120/2 had the greatest resistance to abrasion by laboratory test and required the least mending in service. The hose with the two ends of 90/2 and one end of 120/2 reinforcement was next, followed by the regular two-end reinforcement which had the least resistance to abrasion and needed the most mending."

HOME MANAGEMENT AND EQUIPMENT

Minimum-wage budgets for women: A guide to their preparation, H. R. JETER, L. STITT, H. KYRK, G. M. ANGLE, ET AL. (*U. S. Dept. Agr., Misc. Pub. 549 (1944), pp. 42+*).—This publication is a revision of and supersedes Miscellaneous Publication 324 (E. S. R., 80, p. 570).

What college women spend on clothes, A. C. LATZKE and M. M. WINDHORST. (Kans. State Col.). (*Jour. Home Econ., 35 (1943), No. 9 pp. 555–559*).—The clothing expenditures of a selected group of 200 college women at Kansas State College between October 1, 1941, and October 1, 1942, are summarized and compared with the average clothing expenditures of women as found in the Consumer Purchases Study for 1935–36. The check list prepared for the latter study was used in the personal interviews with the college women.

REPORTS AND PROCEEDINGS

Highlights of the work of the Mississippi Experiment Station: Fifty-sixth annual report for the fiscal year ending June 30, 1943, C. DORMAN (*Mississippi Sta. Rpt. 1943, pp. 54, illus. 14*).—In addition to articles noted elsewhere in this issue or previously, this report contains progress notes on forage crops breeding; pasture investigations; varieties of cowpeas, sorghum, corn, barley, wheat, soybeans, oats, sugarcane, and tomatoes; sweet corn hybrids; cotton and corn breeding; oats and cotton fertilization; phosphorus and potash fixation; boron needs; bur-clover v. commercial nitrogen; peanuts for oil; milk transportation problems; adjustments on Brown loam farms; soil erosion and mulching; methods for planting vetch and its root ecology; silage making with Johnson grass and urea; minerals in beef production; oats, barley, and corn for finishing calves and pigs; northwestern v. southwestern ewes; the importance of feeding dairy cows liberally; mineral requirements and vitamin A production of dairy cows; effects of feed on dairy bulls; Johnson grass silage for dairy cows; improving household management; vitamin and mineral studies on vegetables; sweetpotato culture; investigations with grapes, apples, and other fruits; plant diseases, notably of cotton and tomatoes; value of pasture for poultry and grass and legumes as sources of vitamin A; control of boll weevil in cotton and of insects in stored corn; beekeeping in the Delta; fertilizers and legumes for the Delta; variety and fertilizer tests of vegetables; cottonwood planting and poisoning of unwanted trees; kudzu and other hay and grazing crops; rotations; and fertilizers for tung trees. Most of this material has also appeared in *Mississippi Farm Research* (E. S. R., 90, p. 141).

Annual Report of [Nevada Station], S. B. DOTEN. (Coop. U. S. D. A. et al.). (*Nevada Sta. Rpt. 1943, pp. 27, illus. 4*).—Notes are given on the various projects, including a finding that *Halogeton glomeratus* is a dangerously poisonous plant on the sheep ranges of northeastern Nevada; improving the Rambouillet breed of sheep; annual bromegrasses and Kentucky bluegrass as invaders of sheep and cattle ranges; quality of irrigation waters; economic efficiency of alfalfa hay as a sole ration for dairy cattle; turkey feeding; corn silage for beef cattle; bacillary hemoglobinuria; mineral deficiency diseases of sheep and cattle; encephalomyelitis; and use of phosphates.

Agricultural research in New Hampshire: Annual report of the director of the Agricultural Experiment Station for the year ending June 30, 1943, M. G. EASTMAN ET AL. (*New Hampshire Sta. Bul. 351 (1943), pp. 66, illus. 4*).—Brief summaries, in part noted elsewhere in this issue, are given of the work in progress or completed in agricultural economics, including the marketing of McIntosh apples and savings in egg transportation and farm practices; agricultural engineering, including a home-made power wood saw; dairying, including treatment of streptococcic mastitis and chore practices in dairy barns; field crops and fertilizers, including fertilizer tests with potatoes, rotations with sweet corn as a cash crop, relation of potash levels to persistence of clover and hay stands, and variety and strain tests with oats, barley, corn, and alfalfa; forestry, including propagation of sugar maples, sprout growth of several species, spruce reproduction, and the supply of low-grade woods for plastics; fruit production, including composition of fruit spurs as related to fruit bud formation, winter injury, storage of McIntosh apples, fertilizers and mulches for fruit trees, establishing low-bush blueberries on abandoned farms, improvement of high-bush blueberries, variety tests of raspberries, grapes, and strawberries; insect control, including penetration of contact insecticides and ovicides; ornamentals; pastures, including management studies, the production of full roughage requirements on dairy farms, pasture species for New Hampshire, and eradication of *Ranunculus acris;* breeding strawberries, tomatoes, tetraploid plants, apple rootstocks, *Rubus* spp., watermelons, and beans; plant pathology, including work with bacterial ring spot of potatoes, spraying for apple scab, and disease resistance in tomatoes and muskmelons; poultry, including the etiology, pathology, and prevention of contagious indigestion and studies of viability; soils, including influence of soil texture on growth of potato tubers; vegetable production, including storage of squash and treatment of seeds with hormones; nutrition, including pellets for horse feeds, protein and energy utilization by dairy calves and lactating cows, effect of canning and freezing on ascorbic acid and carotene content of blueberries, and food consumption of New Hampshire families in March; growth of *Gerbera* in the greenhouse; and pullorum testing of poultry.

MISCELLANEOUS

List of bulletins of the agricultural experiment stations for the calendar years 1941 and 1942, H. V. BARNES (*U. S. Dept. Agr., Bibliog. Bul. 4 (1944), pp. 70*).—This is a continuation of previous lists (E. S. R., 86, p. 572).

Colorado Farm Bulletin, [July-August 1944] (*Colo. Farm Bul.* [*Colorado Sta.*]. *6 (1944), No. 4, pp. 15, illus. 17*).—In addition to several articles noted elsewhere in this issue, this number contains the following: What Hybrid Corn Is and How Different Types of Hybrid Corn Are "Made" Explained, by D. W. Robertson (pp. 2, 14, 15); and Irrigation Investigations Work at Station Important to Maximum Crop Production (pp. 3, 4) (coop. U. S. D. A.).

Mississippi Farm Research, [August 1944] (*Miss. Farm. Res.* [*Mississippi Sta.*], *7 (1944), No. 8, pp. 8, illus. 4*).—In addition to articles noted elsewhere in this issue, weather notes for July, and the annual report of the branch stations for 1944, this number contains Modern Gins Are More Profitable and Efficient Than Substandard Gins, by G. G. Miley and A. L. Roberts (pp. 1, 7), an abridgment of Bulletin 403 to be issued; Mississippi Milk Sediment Law, by F. H. Herzer (p. 1); Farm Product Prices, by D. G. Miley (pp. 1, 7); and Production of Sorgo Sirup in Mississippi, by I. E. Stokes, J. F. O'Kelly, and E. B. Ferris (p. 8) (coop. U. S. D. A.), also to be issued as a station circular.

Bimonthly Bulletin, North Dakota Agricultural Experiment Station, [July-August 1944] (*North Dakota Sta. Bimo. Bul., 6 (1944), No. 6, pp. 41, illus. 9*).—In addition to several articles noted elsewhere in this issue, this number contains the following: North Dakota Honors Two Agricultural Scientists (pp. 3-6), (E. S. R., 91, p. 239), and Agencies Cooperating With the North Dakota Agricultural Experiment Station (pp. 14, 27), both by H. L. Walster.

NOTES

Georgia Station.—Director H. P. Stuckey has been appointed chairman of a recently created technical advisory committee of the research committee of the National Peanut Council. There are two sections of this committee, one consisting of practical operators or men engaged in the merchandising of peanuts and the other consisting of scientists whose interest is that of research on peanuts. The men from the peanut industry are to present problems of the industry to the group of research workers who in turn will report results of research and correlate and intensify work on peanuts, including production and utilization. The two branches jointly will report to the council on progress and plans for future work.

Oscar Steanson, a former field representative for the U. S. Treasury Department, has been appointed associate agricultural economist.

Iowa College and Station.—Recent appointments include Dr. Ercel S. Eppright of the Texas College for Women as head of the department of foods and nutrition, Dr. Gladys Everson as assistant professor of foods and nutrition, and V. J. Morford as assistant professor of agricultural engineering. Dr. Pearl P. Swanson, research professor of foods and nutrition, has also been appointed assistant director of home economics research in the station.

New Mexico Station.—A. S. Curry has been designated as acting director during the sickness of Director Fabian Garcia.

New York State Station.—Lawrence M. Bartlett, instructor in entomology, has resigned to become instructor in zoology in the Massachusetts College. Recent appointments include Elizabeth Cato as instructor in chemistry and A. A. LaPlante and Margaret A. Hart as research assistants in entomology and plant pathology, respectively.

Texas Station.—Dr. John C. Ratsek, horiculturist since 1935 and in charge of investigations on rose diseases at Substation No. 2, Tyler, died October 5, aged 41 years. A native of Illinois and a graduate of the University of Illinois in 1926, he received the M. S. and Ph. D. degrees from Cornell University in 1932 and 1937, respectively, and had served there as assistant florist from 1929 to 1935.

Wisconsin University and Station.—Among gifts recently received in aid of research are $9,200 for work on methods of improving the efficiency of producing penicillin; $1,000 for a study of factors involved in the initiation and development of flowering buds of azalea, gardenia, and similar greenhouse plants; $3,000 for a study of the relative influence of dietary fat on microflora of the intestinal tract of rats; $1,200 for a continuation of a study on the nutritive value of butterfat as compared with vegetable oils; $2,500 for a fellowship in poultry nutrition; $4,000 for a fellowship on chemical factors responsible for the insecticidal properties of sabodilla compounds; and $567 for a study of the genetic factors present in the blood of cattle.

President C. A. Dykstra has resigned to become provost of the University of California at Los Angeles, effective about February 1, 1945.

University of Wyoming.—President J. L. Morrill has been appointed president of the University of Minnesota, assuming office there upon the retirement of President W. C. Coffey on July 1, 1945.

Association of Land-Grant Colleges and Universities.—The fifty-eighth annual convention of this association was held in Chicago, Ill., October 24–26, 1944, with preconvention sessions beginning on October 20. The central theme of the convention was The Land-Grant Colleges' Wartime Services, and the address of the president, C. B. Hutchison of California, was entitled The Liberal Education of the "Industrial Classes."

For the ensuing year the vice president, C. S. Boucher of Nebraska, was elected president, R. E. Buchanan of Iowa becoming vice president and Thomas P. Cooper of Kentucky being reelected secretary-treasurer. A. A. Hauck of Maine and G. D. Humphrey of Mississippi were elected to the executive committee for 4-year terms vice W. C. Coffey of Minnesota and E. G. Peterson of Utah, and Dean Hutchison succeeded T. O. Walton of Texas for 1 year.

As officers of the sections, the following were elected: Agriculture, W. G. Taggart of Louisiana, chairman, E. L. Anthony of Michigan, vice chairman, and B. H. Crocheron of California, secretary; engineering, G. P. Stocker of Arkansas, chairman, and J. H. Lampe of Connecticut, secretary; home economics, Mildred T. Tate of Virginia, chairman, Frances L. Zuill of Wisconsin, vice chairman, and M. Marie Mount of Maryland, secretary; and graduate work, E. C. Young of New York, chairman, and J. C. Jordan of Arkansas, secretary. Within the section of agriculture, the subsection of experiment station work elected F. F. Lininger of Pennsylvania, chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, A. W. Gibson of New York, chairman, and S. B. Shirky of Missouri, secretary; and the subsection of agricultural extension work, G. E. Lord of Maine, chairman, and H. J. Reed of Indiana, secretary.

In general, expiring assignments to the standing committees were filled by new appointments, but no changes were made in the committees on relationships, publication of research, accrediting, soil survey, training for Government service, preservation of phosphate deposits, Association organization, and post-war planning. The committee on institutional organization and policy was enlarged by the addition of three additional members, R. E. Buchanan of Iowa for 3 years, J. W. Burch of Missouri for 2 years, and E. L. Anthony of Michigan for 1 year, and M. S. Eisenhower of Kansas succeeded T. B. Symons of Maryland for 3 years. On instruction in agriculture, C. S. Hutchison of Ohio and E. C. Johnson of Washington replaced E. L. Anthony of Michigan and E. O. Holland of Washington for 3 years, and H. F. Cotterman of Maryland filled the vacancy for 1 year occasioned by the death of E. G. Woodward of Connecticut. On instruction in engineering, E. L. Moreland of Massachusetts and G. P. Stocker of Arkansas were succeeded for 3 years by M. P. O'Brien of California and H. M. Crothers of South Dakota, and in home economics Annette T. Herr of Massachusetts and B. Eleanor Johnson of Arizona by Edna L. Skinner of Massachusetts and Ava B. Milam of Oregon.

For 4-year terms on the committee on experiment station organization and policy I. B. Johnson of South Dakota, H. J. Henney of Colorado, and R. A. McGinty of South Carolina succeeded for 4-year terms Edmund Secrest of Ohio, J. A. Hill of Wyoming, and C. H. McDowell of Texas. On extension organization and policy, L. A. Bevan of New Jersey, F. A. Anderson of Colorado, and May Cresswell of Mississippi were succeeded for 4-year terms by C. U. Pickrell of Arizona, J. O. Knapp of West Virginia, and Mary E. Keown of Florida; on military organization and policy Walter Hullihen of Delaware and C. B. Hodges of Louisiana by A. C. Willard of Illinois and B. R. Van Leer of North Carolina; and on land-grand institutions for Negroes, L. N. Duncan of Alabama by Gibb Gilchrist of Texas. R. C. Clothier of New Jersey replaced H. L. Donovan of Kentucky as a delegate to the American Council of Education.

Cooperative Experiment Station in El Salvador.—This station is another in the chain of cooperative stations for Latin America (E. S. R., 88, p. 722). Originally planned to be located at Zapotitan, a new site has been selected at San Andrés, which is on the Pan-American Highway 32 kilometers north of San Salvador. A tract of 595 acres has been allocated by the Government of El Salvador, half of which is under gravity irrigation. Buildings, including an administration building with offices, library, and conference hall, and laboratories, residences for the staff, and farm school buildings for 80 boys, are under construction. The chief immediate interests of the station are in a project on derris (assisted by a shipment of 12,000 cuttings from the Puerto Rico Federal Station), roselle fiber, cinchona, and rubber, but plans are being made to study plant sources of edible oils, coffee and its diseases, the improvement of corn, beans, and other subsistence crops, and the expansion of beef production and dairying. Research will also be taken up on rural resettlement problems in a new village to be established at San Andrés by a Salvadoran institution known as Social Betterment, Inc.

Agricultural Research in U. S. S. R.—According to current information, scientific workers at the Leningrad Institute for Plant Culture who were evacuated early in the war have now returned, and the restoration of the greenhouses, laboratories, and other equipment destroyed is under way. The experimental station is situated 3 miles from Pavlovsk, near Leningrad, and had given major attention to the development of improved varieties of fruits. While many of the collections were removed to Germany and the remainder neglected, seeds sent to other parts of the Soviet Union have been found to give normal results. It was expected that the autumn of 1944 and the spring of 1945 would provide farm nurseries with 100,000 strawberry cuttings, 50,000 fruit trees, 60,000 currant bushes, and many other plants, while by next summer about 3,000,000 seedlings and cuttings from fruit trees and bushes will be ready. Extensive plans for scientific research are also being made.

Reorganization and expansion are also going on at the Moscow Botanic Gardens, where it is planned to enlarge the area from 250 to 750 acres. The work is organized under sections of plant evolution, experimental ecology, cultivated plants, dendrology, horticulture, and floriculture.

The Academy of Sciences has established an experiment station in northern Siberia, known as the Mountain Targa Station. Located in the Nkrivoi Kliuch Valley near the city of Voroshilovussurisky, breeding and selection programs are under way looking toward the development of better crops for cold, short-season regions, the production of hardy fruit trees and bushes, and the adaptation of local wild species to food and medicinal purposes. New methods developed at the station are said to have brought about a potato production of about 12 tons per acre in large-scale fields.

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EXPERIMENT STATION RECORD

Vol. 92 FEBRUARY 1945 No. 2

RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY AND MICROTECHNIC

The effect of α-tocopherol and β-carotene in the oxidation of plant and animal fats, C. R. THOMPSON and H. STEENBOCK. (Wis. Expt. Sta.). (*Arch. Biochem., 4 (1944), No. 1, pp. 15–23, illus. 4*).—The rate of oxidation measured with a Warburg respirometer by a procedure briefly described was determined on plant and animal fats with and without small additions of α-tocopherol or β-carotene. The α-tocopherol had no effect on the induction period of cottonseed oil, soybean oil, lard and oleo oil. After the fats had been freed from antioxidants by adsorption of these constituents from a petroleum ether solution of the fat forced through a column of activated Al_2O_3, then through one of Neutrol Filtrol mixed with Hy-Flo Super Cell, the antioxidant effect of the α-tocopherol was easily demonstrable. β-Carotene was found to be an active prooxidant, shortening the induction period and accelerating the rate of oxidation at the end of the induction period in the fats from which the antioxidants had been chromatographically removed. The prooxidant effect of the carotene was greater with cottonseed and soybean oils than with the lard and the oleo oil. Similarly it was greater with ethyl linolate than with ethyl oleate.

A simplified fluorometric method for riboflavin in meat, B. A. MCLAREN, S. COVER, and P. B. PEARSON. (Tex. Expt. Sta.). (*Arch. Biochem., 4 (1944), No. 1, pp. 1–5*).—The simplified fluorometric method, for which details of procedure and method of calculations are presented, was developed for routine assays of meat. Extraction of the riboflavin was accomplished with a combination of the enzymes papain and takadiastase at pH 4. Fat and protein were chief impurities in the extract. Fat was effectively removed with chloroform and most of the protein precipitated upon adjustment of the unknown to pH 6.8 to 7.0, at which riboflavin exhibits maximum fluorescence. The interference from traces of pigment was overcome by adding a known amount of the standard riboflavin directly to the cuvette containing the unknown. A blank was obtained by adjusting the solution in the cuvette to pH 11.0, at which the fluorescence of riboflavin is destroyed. The entire analysis was carried out under subdued light. The recovery of riboflavin added prior to digestion was 96–97 per cent. Analysis of nine samples of raw beef gave results averaging 1.21 μg per gram, which were in good agreement with results with the microbiological method averaging 1.43 μg. per gram.

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[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

Histamine content of unprocessed and canned fish: A tentative method for quantitative determination of spoilage, E. Geiger. (*Food Res., 9 (1944), No. 4, pp. 293–297, illus. 1*).—"It is proposed to use the determinations of the histamine content as one criterion for the relative freshness of fish."

Calcium, phosphorus, and iron contents of turnip greens as influenced by method of sampling, J. Whitacre, S. H. Yarnell, A. G. Oberg, J. M. McCrery, and L. McWhirter. (Tex. Expt. Sta.). (*Food Res., 9 (1944), No. 1, pp. 56–65, illus. 1*).—"Three methods of sampling have been used for harvesting turnip greens—random from single 16-ft. rows, composite-random from the same rows, and total-population from 16-ft. rows each divided into four plats. Samples consisted of 1,500 to 2,000 gm. each. Two sets of four rows each provided the random samples; from each set, four single-row and four composite were taken, a total of 16 samples. For the total-population samples four rows of four plats each were used to supply 16 samples. Moisture in the fresh greens and calcium, phosphorus, and iron in the dried material were determined.

"Mean values of four samples from each method of sampling gave acceptably low standard errors and standard deviations in comparison with total population from 10-ft. rows. With calcium only one significant difference was found between comparable samples, which were one pair of single-row and composite-random samples. The explanation offered is the higher proportion of outer leaves in the single-row sample, which was higher in calcium than in the composite. Significant differences in phosphorus and iron content were found in only part of the total-population samples. One row was significantly higher in phosphorus than the other three, which did not differ significantly among themselves. Three significant differences were found among six row v. row comparisons of iron in total-population samples. All rows were involved in these differences. The rows ranked in an entirely different order in mean content of iron than in phosphorus; the row of highest value in phosphorus held third place in iron. The possibility is suggested that variation in soil was responsible for the inconsistent differences in phosphorus and iron. The findings in this study point to the economy of time and labor in the use of no more than four random-composite samples taken from several rows to determine the approximate composition of greens, provided experimental design, sufficient homogeneity of the soil, and uniformity of cultural treatment permit."

Proposed use of starch sponges as internal surgical dressings absorbable by the body, C. W. Bice, M. M. MacMasters, and G. E. Hilbert. (U. S. D. A.). (*Science, 100 (1944), No. 2593, pp. 227–228*).—A 5-percent suspension of purified cornstarch is pasted by heating and then sterilized by heating in an autoclave for 15–20 min. at 15 lb. per square inch gauge pressure. The autoclaved paste is placed in shallow pans or other containers, as desired, and frozen slowly, preferably at a temperature just below 0° C. The higher the freezing temperature, the coarser and stronger is the resulting sponge. When freezing is complete, the paste is removed from the freezer and allowed to thaw. Sponges having different textures may be prepared by varying the pasting and freezing conditions and the kind and concentration of starch used. Sterile sponges can be prepared by autoclaving the paste and carrying out the rest of the preparation under aseptic conditions, or the final product can be simultaneously toughened and sterilized by immersion in 70-percent alcohol. Dried sponges can be sterilized by autoclaving, as is absorbent cotton.

Starch sponges will take up 15–18 times their own weight of aqueous or alcoholic solutions. Unlike cotton, they are firm enough to retain the absorbed liquid during gentle handling. They can be air-dried at temperatures up to 105° to light, rather brittle masses which return rapidly to their original soft state when remoistened. In water, they are only moderately strong and disintegrate slowly if subjected to mechanical strain. In 70-percent alcohol, on the other hand, they remain soft and pliable but become quite tough and retain their structure almost indefinitely. Several methods by which medicinals as, for example, penicillin, sulfathiazole, sulfapyridine, or other drugs can be introduced into a starch sponge are noted.

Perfume from the flowers of the coffee tree, N. G. ARRILLAGA. (P. R. Fed. Expt. Sta.). (*Jour. N. Y. Bot. Gard., 45 (1944), No. 536, pp. 180-181, illus. 2*).—The concentrated essence ("absolute") of the flowers of the coffee tree (*Caffea arabica*) was found to have an agreeable aromatic perfume remindful of the bouquet of jasmine, and mimosa; many essential-oil dealers who have examined the product are said to have expressed considerable interest and enthusiasm over its possibilities.

A collaborative study of methods for the determination of amylase activity, A. D. DICKSON. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 1, pp. 31-35*). —Three laboratories submitted data, but one differed from the others in extraction procedure. Fairly good agreement was obtained between two laboratories with the Sandstedt, Kneen, and Blish dextrinizing procedure (E. S. R., 83, p. 440) and with the Jozsa and Johnston viscosity measurement method (E. S. R., 75, p. 160). The agreement with another viscosity method was unsatisfactory. Within laboratories the correlation of data obtained by the three methods on the six malts was very high. Of the viscosity measurement methods, it is noted that they give reliable results only in the hands of experienced operators, and even there the variation is too great. The committee recommends that the various methods for α- and β-amylases be submitted to further study, with the purpose of determining the cause of variability in results and of modifying the procedures to give better agreement between laboratories.

Soybean amylase.—II, Further purification of crude soybean beta-amylase concentrates, J. M. NEWTON, R. M. HIXON, and N. M. NAYLOR. (Iowa State Col.). (*Cereal Chem., 20 (1943), No. 1, pp. 23-31, illus. 1*).—In the preparations described in the second paper of this series (E. S. R., 83, p. 583), the dry concentrate contained from 17 to 27 percent of the extractable β-amylase present in the original soybeans. A method for further purification of the crude soybean β-amylase concentrates gave a preparation which produced 4,580 times its weight of maltose in 30 min. at 40° C. The concentration procedure was applied to low-activity materials with satisfactory concentration and recovery of the β-amylase.

The dry amylase preparations were found to retain full activity for 2 yr. in an ordinary refrigerator. Heating the ground soybeans for 10 days at 100° did not completely inactivate the amylase. The amylase was destroyed by dry heat at 200° for 30 min. A sample of soybeans which had been extracted in a continuous extractor with trichloroethylene as a solvent, the excess solvent being removed from the beans by heating 100°-130° for 60 min., was found to have lost about 70 percent of the amylolytic activity.

Inactivation of alpha- and beta-amylase in aqueous malt extracts, W. J. OLSON, B. A. BURKHART, and A. D. DICKSON. (Univ. Wis. and U. S. D. A.). (*Cereal Chem., 20 (1943), No. 1, pp. 126-138, illus. 4*).—The rate and extent of inactivation of the amylase components of malt extracts were measured at 60°, 65°, and 70°, and at pH 3.3 and 0° C. Measurements of saccharification of soluble starch, of liquefaction of raw starch paste, and of dextrinization of both soluble starch and amylodextrin were made in the original and in the partially inactivated extracts.

Complete inactivation of β-amylase was not attained at 60° for the maximum time studied (90 min.). At 70° the β-amylase was completely inactivated after 15 min. treatment, while at 65° approximately 20 min. were required for complete inactivation. At pH 3.3 and 0° the loss of dextrinizing or α-amylase activity was extremely rapid. The maximum effect was usually obtained in 5 min., with relatively little reduction of saccharifying power. Most of such reduction as did occur appeared due to loss of α-amylase. A highly significant correlation between starch-liquefying power and dextrinizing power was found. These two effects are probably produced by the same component of the diastatic system.

The chemical composition of commercial hybrid and open-pollinated varieties of dent corn and its relation to soil, season, and degree of maturity (a preliminary report), D. M. Doty, M. S. Bergdoll, and S. R. Miles. (Ind. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 1, pp. 113–120, illus. 3*).—In maturing corn, the percentages of protein, fiber, and ash in the grain decreased to a constant value. The percentage of fat increased to a value which remained constant or decreased slightly. These changes occurred in three hybrids in three seasons. Seasonal variations caused variations in the protein and fat content of corn grain. The protein content was also affected by soil type and location.

There were no significant differences in the chemical composition of more than 40 commercial hybrids and open-pollinated varieties of dent corn. The composition of yellow varieties tested was practically the same as that of white varieties grown under the same conditions in the field.

Reduction of the fermentable carbohydrate content of corn by kiln drying, S. L. Adams, W. H. Stark, and P. Kolachov (*Cereal Chem., 20 (1943), No. 2, pp. 260–266, illus. 2*).—Kiln drying of corn was found to result in a 2- to 3-percent decrease in alcohol yield, and, under certain conditions, at temperatures of 200° F. and above, may result in a decrease of 4 to 6 percent in the alcohol yield. The action of heat on the fermentable carbohydrate portion of the grain, although not definitely characterized, probably consists in the formation of a certain proportion of unfermentable dextrins.

Micro milling and baking of small samples of wheat, M. E. McCluggage. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.) (*Cereal Chem., 20, (1943), No. 2, pp. 185–193, illus. 2*).—The technics here described are not proposed as short cuts, and the time required for testing samples by these methods is stated to be approximately the same as that for the regular laboratory procedures. Advantages of the micro methods are that only about 1 lb. of wheat is required, as compared with the usual 5-lb. sample, and that the regular laboratory wheat grinder is used for the milling, thus eliminating the necessity of owning a micro experimental mill, which is expensive. It is believed possible to develop small-size fermentation cabinets and baking ovens so that the entire equipment for milling and baking would require very small space. These methods are considered of importance to any plant breeder who has a few samples to test each year and desires baking information in the early stages of development of new varieties of wheat.

Effects of moisture on the physical and other properties of wheat, II, III, C. O. Swanson. (Kans. Expt. Sta.). (*Cereal Chem., 20 (1943), Nos. 1, pp. 43–61, illus. 2; 3, pp. 286–299*).—The two papers here dealt with extend an investigation previously noted (E. S. R., 87, p. 471).

II. *Wetting during harvest.*—In paper 2, the author reports that the most apparent effects of weathering were lowering of test weight, decreasing the external vitreous appearance and internal vitreousness, depressing the grade, and increasing the percentage of the internal mealiness. The percentages of flour from the weathered wheats averaged as high as from the nonweathered, without a corresponding change in ash. There were no essential differences in the percentages of flour obtained from the different wheat grades. The mixograms indicated that weathering lengthens the time of dough development, slightly depresses the height of the curve, decreases the development angle, and increases the tolerance angle, but decreases the angle of weakening. The loaf volumes, adjusted in protein, were larger for the weathered than the nonweathered with one exception, in which the curve pattern indicated that the weathered wheat was Chiefkan and the nonweathered was Turkey or Blackhull. The larger loaf volumes of the weathered samples were not due to the higher maltose values. Differences between averages of nonweathered and weathered were not significant. The average maltose value of the flours from six 100-percent-vitreous wheats was about one-third higher than the average of the weathered samples. The larger loaf volumes obtained from the weathered samples as compared with the nonweathered samples were due to changes similar to those which take place in aging, and give baking qualities better than those of new wheat.

The data indicate that weathered wheats which show no other damage are unduly penalized by the prevailing grain grading standards.

III. *Degree, duration, and number of wetting treatments.*—Paper 3 presents the results of (1) wetting wheat to various percentages and prolonging the wetting period from 1 to 6 days at laboratory temperatures and 6 days at 45° F.; (2) increasing and decreasing the percentages to which wheat was wetted, with drying between wettings; and (3) comparison of the effects of wetting Tenmarq and Chiefkan wheats.

The test weights decreased progressively with the increased percentages of wetting, but the rate of decrease was larger with the first additions of water than with the later. Neither the duration of storage nor the 45° storage temperature had any marked influence. The extent to which wheat was wetted had more influence on the decrease in test weight than had the number of times wetted. The comparisons between Tenmarq and Chiefkan were inconclusive. It was found that the decrease in test weight from wetting is caused by loosening the bran coat and the swelling of the endosperm. The swelling of the endosperm changed the internal texture from vitreous to semivitreous and mealy. This change was more extensive with the increased percentages of moisture but was affected very little by the duration or the 45° storage temperature of wetting. The flour yield was not lowered by the wetting, nor by the duration or the 45° storage temperature after wetting. The best baking results were obtained from the samples wetted the most for short periods. The 45° temperature had but little effect on baking values at any of the levels of wetting. Wetting affected mixing properties of the flour. The average of the measurements of the mixer curves showed an increase in time of development, a slight decrease in height, a decrease in the angles of development and weakening, and an increase in the angle of tolerance. These trends were in the same direction as those observed in studies of damaged wheats, but in most of these samples the changes had not proceeded far enough to injure the baking results.

Studies on treating wheat with ethylene.—I, Effect upon high moisture wheat, W. S. HALE, S. SCHWIMMER, and E. G. BAYFIELD. (Kans. Expt. Sta. and U. S. D. A.). (*Cereal Chem., 20 (1943), No. 2, pp. 224–233, illus. 4*).—Two bins each of approximately 325 bu. capacity were filled with relatively uniform wheat of high moisture content (17.2 per cent). During filling, one bin was treated with ethylene in the proportion of approximately 1 part in 10,000 of air.

Application of ethylene to the freshly harvested high moisture wheat increased the rate of carbon dioxide evolution. The treated wheat did not heat as rapidly nor as much as the untreated. The grade of the grain, the percentage germination, and the baking performance of the treated samples were superior to those of the untreated during several months of storage.

The experiment is held to indicate that although ethylene gas does not prevent spoilage of wheat stored with a high moisture content, heating of such wheat may be materially retarded.

The action of glutathione and wheat germ on dough in relation to proteolytic enzymes in wheat flour, E. ELION (*Cereal Chem., 20 (1943), No. 2, pp. 234–250, illus. 3*).—By an analysis of the published work on the subject and new experimental evidence, the author supports the theory that the action of oxidizing agents as flour improvers is due to inhibition or destruction of proteolytic enzymes and the contrary effect of reduced glutathione to an activating influence upon these enzymes.

Stability of wheat gluten dispersions toward reducing agents in the presence of a gluten proteinase, H. S. OLCOTT, L. A. SAPIRSTEIN, and M. J. BLISH. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 1, pp. 87–97, illus. 4*).—Gluten dispersions in dilute acetic acid may be stabilized by heating for 5–10 min. at 100° C. The solubility characteristics of the gluten proteins were not appreciably altered, but an enzyme (proteinase) responsible for the instability was destroyed. The proteinase was inactivated or inhibited in 10-percent sodium salicylate, but activity was restored and the proteinase-induced hydrolysis continued if the salicylate was removed. Reducing agents increased the enzymatic hydrolysis slightly, but they also markedly reduced the viscosity of gluten freed from enzyme activity by heat or by the presence of 10-percent sodium salicylate.

It is concluded that the primary effect of reducing agents on glutens is a chemical one upon the proteins and only secondarily that of enzyme activation, and it is suggested that a similar explanation may be applied to the effect of reducing agents, but not necessarily oxidizing agents, on doughs.

Fractionating and reconstituting techniques as tools in wheat flour research, K. F. FINNEY. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem., 20 (1943), No. 3, pp. 381–396, illus. 7*).—Flours of the wheat varieties Chiefkan, Kharkof, and Thatcher were fractionated into starch, gluten, and water-soluble fractions. These fractions were then recombined in the original and in different proportions, and the recombinations, together with the original nonfractionated flours, were baked into bread. Gluten fats were also extracted with ethanol, with light petroleum, and with ethanol followed by light petroleum. Also, the various fractions of some varieties were interchanged before baking. In other experiments, the flour protein content of the three varieties was also increased by adding varying quantities of their own gluten and in some trials reduced by adding starch.

It was found possible to fractionate flours in this way, to recombine them in their original proportions, and to secure bread equal to that made with the original or nonfractionated flour within the limits of random error. The recognized differences in bread quality between Chiefkan and Kharkof were entirely accounted for by differences in their gluten fractions. The fat extracted from Kharkof and Chiefkan gluten did not account for any of the difference in their baking quality. Omission of the water-soluble fraction from reconstituted doughs of Kharkof flour resulted in no reduction in loaf volume or bread quality, but omission of this same material from Chiefkan dough resulted in a significant loaf volume reduction. For Thatcher, this volume reduction was very large. The water-soluble fractions appeared to contain protein-softening or conditioning materials which vary in quantity or composition between different varieties.

The relation between protein content and loaf volume was found substantially linear from 7 or 8 percent to at least 20 percent protein, provided enough bromate was used, especially at the higher protein levels. The regression coefficient, or loaf volume correction factor for protein content, can therefore be applied within these limits. Below 7 percent protein the relation was definitely curvilinear, all curves meeting at 0 percent protein and about 275 cc. loaf volume. The regression of loaf volume with protein content is different for different varieties and appears to be a function of the loaf volume that may be produced by a variety at any arbitrary protein level within the range of linearity. One can thus determine the factor for correcting the loaf volume of a given sample to a constant protein basis from a knowledge of its protein content and loaf volume and eliminate the need of loaf volume data for the variety or sample in question at several protein levels.

The effect of millroom temperature and relative humidity on experimental flour yields and flour properties, E. G. BAYFIELD, J. E. ANDERSON, W. F. GEDDES, and F. C. HILDEBRAND. (Kans. and Minn. Expt. Stas. et al.). (*Cereal Chem., 20 (1943), No. 2, pp. 149–171, illus. 1*).—The Tenmarq and Kanred varieties of hard red winter wheat were milled in duplicate on mills of two specified commercial makes at millroom temperatures of 70°, 80°, and 90° F. and relative humidities of 40, 50, 60, 70, 80, and 90 percent. Determinations of flour yield, granulation, moisture, ash, protein, maltose value, and loaf volume were made, and the data were submitted to statistical analysis. Flour yield decreased with increasing temperature and humidity, the effect of humidity being greater at the higher temperatures. The effect of temperature was greater in the instance of Kanred wheat. Flour granulation tended to become coarser with increasing temperature. Increasing humidity increased flour fineness in one mill, whereas in the other the most finely granulated flour was obtained at 70 percent relative humidity. A more finely granulated flour was produced by the first than the second mill, and by Kanred in contrast to Tenmarq wheat. Flour moisture increased with decreasing temperature and with increasing humidity. Flour ash increased with decreasing temperature and relative humidity. Flour protein responded to variations in temperatures, humidities, and mills in the same manner as flour ash. Maltose value increased with decreasing temperature, while the effect of humidity was relatively slight and not consistent. Loaf volume was significantly affected by relative humidity, the lowest values being obtained at 70 and 90 percent. Temperature and mills were without effect.

Simplified procedures for the determination of thiamine in wheat flours and bread by the thiochrome method, D. GLICK (*Cereal Chem., 21 (1944), No. 2, pp. 119–126, illus. 1*).—The Hennessy method, modified slightly by adding alkali before the ferricyanide in the oxidation step and by correcting the results for the volume of the sample in the extracting medium, was applied to wheat flours and bread. A detailed description is given of a simplified procedure as applied to patent, straight, clear, low-grade, and enriched flours, and as adapted for whole-wheat flours in order to elminate the fluorescent effect of interfering substances. The procedure for bread is also given. Results by the Hennessy method are compared with those by the simplified method which is based on the British procedures (E. S. R., 88, p. 436). The two methods gave results that were in satisfactory agreement providing the correction for volume of sample was applied to the Hennessy method. The advantages claimed for the simplified procedure include omission of extraction at elevated temperatures and omission of enzyme digestion or base exchange purification; in the case of breads, hot extraction and the base exchange step were eliminated. It was also shown that methanol increased the rate of destruction of thiamine in solution.

Testing the baking strength of gluten concentrates, T. R. AITKEN and J. A. ANDERSON (*Cereal Chem., 20 (1943), No. 1, pp. 79–81*).—It is shown that the average difference in loaf volume (70 cc.) of natural flours differing in protein content by 1 percent is about twice as great as the average increase (36 cc.) obtained on increasing protein content 1 percent by adding a dried gluten preparation. Differences in quality among glutens prepared from high-, medium-, and low-protein wheats were not demonstrated. It is suggested, however, that "further replication may show that such differences exist."

The complementary baking properties of Minnesota spring and winter wheat varieties, P. P. MERRITT and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 1, pp. 98–103, illus. 1*).—Flours made from Thatcher, a Thatcher backcross, and Merit (spring wheats) and from Minturki backcross (a winter wheat) were baked with mixing times of 2 and 4 min. and fermentation times of 2 and 3 hr. Flour blends containing 25, 50, and 75 percent of the winter wheat flour were made with each of the spring wheat flours and similarly baked.

The relative strength of the unblended flours, as indicated by the average loaf volumes for all treatments, was, in decreasing order, Thatcher, Thatcher backcross, Minturki backcross, and Merit. The varieties differed markedly in their response to the different baking procedures, however. Merit and Minturki backcross exhibited the least differences between the various treatments and Thatcher backcross the greatest. Loaf volumes of the blends did not appear to be proportional to the calculated values based on the volumes of the component flours, the direction and magnitude of the divergences depending to a large extent on the baking procedure. Differential baking treatments in variety testing are considered valuable in providing an indication of the mixing and fermentation requirements.

Yeast variability in wheat variety test baking, K. F. Finney and M. A. Barmore. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem., 20 (1943), No. 2, pp. 194–200, illus. 4*).—A uniform sample of flour stored at 35° F. produced, over a period of about 4 mo., loaf volumes varying from 855 to 980 cc., the volume depending on the lot of yeast used. Flours representing a wide range in protein content for each of several hard red winter wheat varieties, baked with normal and with subnormal yeast in a rich, highly bromated, milk-containing formula, gave loaf volume discrepancies, resulting from the use of subnormal yeasts, which were greatest at the higher protein levels and in varieties that normally produce high loaf volume. The degree of variability existing in the yeast used was also an important factor influencing the volume discrepancies. The data show that distinctly misleading figures may result from failure to consider variation in yeast. Normal, fresh yeast was found to retain its baking properties unimpaired for at least 18 days when stored at 35°, but by the twenty-seventh day showed definite deterioration.

Adjustments for subnormal yeasts can be made by increasing their concentration in the formula in proportion to the degree of subnormality. A uniform and apparently optimum amount of dough development was thus obtained. The authors' procedure is to test each lot of yeast by making replicate bakes with a uniform lot of flour kept for the purpose and to discard all lots of yeast that do not meet predetermined standards.

Description of mixograms, C. O. Swanson and J. A. Johnson. (Kans. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 1, pp. 39–42, illus. 1*).—This paper deals with proposed descriptive diagrams, mainly an angle determined by the shape of the tracing and drawn thereon, which is designated the "development angle."

Factors which influence the physical properties of dough.—V, Gluten protein as the main factor affecting the pattern of mixograms, C. O. Swanson and A. C. Andrews. (Kans. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 1, pp. 61–78, illus. 6*).—This is a continuation of a series previously noted (E. S. R., 89, p. 20).

The recording dough-mixer tracings obtained from mixtures of high-protein flours with starch, arranged to provide a series of samples of decreasing protein contents, differed markedly from those obtained from flours of protein contents the same as those of the mixtures. It appeared that the gluten in high-protein and in low-protein flours reacts somewhat differently in mixing. Mixer curves made with mixtures of finely ground gluten and starch had the same general pattern as had those made from mixtures of high-protein flours and starch. The mixing curves from Chiefkan gluten and starch had patterns similar to those of the curves obtained from Chiefkan flour. Similar results were observed with Tenmarq flour.

Additions of small but increasing quantities of pyridine produced mixer curves similar to those obtained from flours of progressively decreasing protein contents. Pyridine added to gluten and starch produced the same general pattern as was obtained from its addition to flours.

The mixer curves presented indicate very clearly that gluten-protein is the main factor in the determination of patterns and also that a commercial surface-active agent which was tested had very little if any effect on the starch. The reduction of the interfacial tensions in the dough by the surface-active agent appeared to be a factor in promoting interspreading among the starch granules and intrapenetration of the water into the protein micelles or gluten particles. The starch was found to have very little if any influence on the main mixer curves patterns.

The prediction of loaf volume of hard red spring wheat flours from some properties of mixograms, R. H. HARRIS, L. D. SIBBITT, and O. BANASIK. (N. Dak. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 2, pp. 211–223, illus. 5*).—Data computed from certain properties of recording mixer curves made from 30 samples of 8 varieties of hard red spring wheats were correlated with the loaf volumes obtained following 2- and 3-hr. fermentations. Similar data yielded by flour-water doughs were also examined. The curve properties considered were (1) cosine of the angle of dough development, or angle (α) which the ascending portion of the curve makes with the horizontal; (2) sine of the angle of decline of the curve, or angle (β) which the descending portion of the curve makes with the vertical drawn through the curve peak; (3) length in millimeters of the horizontal line between the point where it is cut by the tangent to the ascending curve and the vertical line dropped from the midpoint of the distance representing dough stability; and (4) height in millimeters of the peak of the curve from the base line. These factors were combined in an equation to yield a value indicative of the loaf volume of the flour under examination. In this equation, the loaf volume (V) is expressed as $V = K(\cos\alpha\text{-}\sin\beta)AB \times BC$, in which BC is the height of the curved peak above the base line and AB is the length of the tangent to the ascending portion of the curve from the base line to peak.

A high correlation between the calculated and actual loaf volume was found when the curves were made from doughs containing the usual baking formula and mixed and fermented 3 hr. in the same manner as for baking bread. This correlation was large enough to render possible the prediction of actual loaf volume by the equation. The length of line between the tangent to the rising curve and the vertical through the midpoint of dough stability was related to a lesser degree with loaf volume. The other curve properties considered had little or no relationship to loaf volume. When the doughs were fermented for shorter periods than 3 hr., the relationship between actual and calculated loaf volume disappeared. The values calculated from curves made from doughs following 2, 1, and 0 hr. of fermentation were found to have no significant correlation with the actual loaf volumes of the flours obtained from either 3 or 2 hr. of fermentation. Mixer curves made from doughs containing the malt-phosphate-bromate-formula ingredients showed wheat varietal differences more distinctly and were easier to interpret in terms of curve properties studied. Band width was increased.

A nomograph for cereal laboratories, T. S. LEARY and F. F. FARLEY. (Iowa State Col.). (*Cereal Chem., 20 (1943), No. 1, pp. 139–140, illus. 1*).—Two lines diverging from a common point are ruled to represent percentages of protein on the upper side of each line, on the moist and the moisture-free basis, respectively; the gradations on the under sides of the two lines representing the percentage of ash, of fat, or of fiber on the moist and on the moisture-free basis, respectively. The third line is so placed and inclined that by joining the point of origin of the other two lines to the point indicating the percentage of moisture on the third line and placing one side of a right-angled triangle along the straight edge, the other side of the right angle will intersect the percentage on the moist basis on the upper and the percentage on the dry basis on the lower of the two diverging lines.

Electronic microscopy, V. K. ZWORYKIN and J. HILLIER (*Sci. Mo., 59 (1944), No. 3, pp. 165–179, illus. 18*).—The authors present a brief survey of this rapidly growing science. It is shown how the electron microscope can be employed to extend the usefulness of the light microscope in almost every field where the latter is applied. Some of the auxiliary types of electronic equipment being developed around the electron microscope are briefly described. After 3 yr. of intensive research by what is still a relatively small group of workers, this instrument is "slowly but surely being established in its true role—that of a high-powered aid to our vision. It is only when the electron microscope is used as a visual guide to and a check on the complete investigation of a problem that its maximum value to science is realized."

A closed cell for electron microscopy, I. M. ABRAMS and J. W. MCBAIN (*Science, 100 (1944), No. 2595, pp. 273–274, illus. 1*).—For many purposes it is desirable to study a specimen in its original medium without desiccation and possible alteration; a simple closed chamber for such use is here described and its construction illustrated by line drawings.

Improving smear technics by the use of enzymes, S. L. EMSWELLER and N. W. STUART. (U. S. D. A.). (*Stain Technol., 19 (1944), No. 3, pp. 109–114, illus. 2*). —The method described for securing spreading of large meiotic chromosomes consists in treating a piece of fixed anther thoroughly washed in water in a 1 percent solution of Clarase—a proprietary enzyme complex—or in an extract prepared by grinding the contents of flask cultures of certain fungi (*Aspergillus niger, Chaetomium globosum, Metarrhizium* sp.) with quartz sand in a mortar containing 10 cc. of a sodium acetate buffer, pH 5. This treatment destroys some of the elasticity of the cytoplasm so that the chromosomes remain spread out when light pressure is exerted on the cover slip. The usual stain technic is then employed.

A simple nuclear stain and staining technique for Helminthosporia, G. K. PARRIS. (Va. Truck Expt. Sta.). (*Phytopathology, 34 (1944), No. 7, pp. 700–702*).—Considerable difficulty has been experienced with retention of *Helminthosporium* material on a cover slip or slide during staining procedures preparatory to microscopic examination. This note gives the detailed technics for inducing sporulation and for staining and preparation of microscope slides; with certain modifications the methods should be adaptable to other fungi.

A differential stain for rubber in guayule, F. T. ADDICOTT. (U. S. D. A.). (*Stain Technol., 19 (1944), No. 3, pp. 99–102*).—The schedule detailed, combining an intense blue stain for rubber with sharply contrasting red counterstains, was found satisfactory for use in an anatomical study of rubber deposition in guayule.

Oil blue NA as a stain for rubber in sectioned or ground plant tissues, R. T. WHITTENBERGER. (U. S. D. A.). (*Stain Technol., 19 (1944), No. 3, pp. 93–98*). —Oil blue NA (Calco), coloring rubber bright blue, is reported to have been used effectively in studying the distribution of rubber in several plant species; detailed procedures are given for its use on fresh or fixed sections and in milled or ground tissues. A microscopic technic is also presented whereby it is possible to determine approximately the relative proportion of dispersed and coagulated rubber latex in unstained tissues.

A dry ice freezing unit for rotary microtomes, M. NICKERSON (*Science, 100 (1944), No. 2591, pp. 177–178, illus. 1*).

AGRICULTURAL METEOROLOGY

Twenty-five years progress in meteorological science, F. MAHAFFY (*Jour. Roy. Astron. Soc. Canada, 37 (1943), No. 8, pp. 319–332*).—An address summarizing the high points of progress.

Observation methods for reliable meteorological data, S. P. FERGUSSON (*Amer. Met. Soc. Bul., 25 (1944), No. 7, pp. 289–298, illus. 16*).—This discussion considers the effects of changes in exposure on wind and precipitation records, exposure of thermometers and hygrometers, self-registering thermometers v. thermographs, desirable improvements in thermometers, and hygrometry; temperature, dew point, vapor pressure, and relative humidity; and barometry, recording instruments, anemometry, ombroscope, improved pole-star recorder, state of the sky, and symbols for clouds.

Weather trends indicated by degree-day study, R. LITTLE (*Heating and Ventilating, 41 (1944), No. 4, pp. 63–66, illus. 7*).

The effect of vertical motion on local temperature and pressure tendencies, H. A. PANOFSKY (*Amer. Met. Soc. Bul., 25 (1944), No. 7, pp. 271–275, illus. 2*). —It is often assumed that temperature tendencies aloft and differences in pressure tendencies between fixed levels can be computed from analysis of pilot balloon observations alone, the assumption involved being that horizontal advection is the principal cause of local warming and cooling in the free atmosphere. This assumption is here tested, with the tentative conclusion that the effect of vertical motion and other factors on temperature and pressure tendencies is almost equally as large as the effect of horizontal advection. Two methods of estimating vertical velocities are suggested.

Horizontal convergence and its relation to condensation processes, S. M. NEAMTAN (*Amer. Met. Soc. Bul., 25 (1944), No. 6, pp. 223–229, illus. 2*).—Frequent references are found in meteorological literature to the idea that horizontal convergence favors condensation, and from time to time the word "convergence" appears in a forecast as an explanation of the existence of clouds, fog, or precipitation. The author attempts to show that the explanation commonly given of the relation between convergence and condensation is inadequate and presents data for establishing the relation on a more rigorous basis.

Snow melting and evaporation, A. R. CROFT. (U. S. D. A.). (*Science, 100 (1944), No. 2591, pp. 169–170*).—Melting and evaporation of snow during the winter and spring seasons on the high mountains and plateaus of the Intermountain region are of considerable interest because they have a direct bearing on the timeliness, rate, and amount of stream flow made available during the rest of the year for irrigation, power, and other purposes. To augment the meager knowledge of these phenomena, preliminary studies of snow melting and evaporation were conducted at elevations of 8,700–10,000 ft. on a portion of the Wasatch Plateau in central Utah during the snow-melting season of 1942; some of the results are here briefly summarized.

Estudios acerca de la medida de la evaporacion [Studies on measurement of evaporation], W. C. THORNTHWAITE (*Rev. Soc. Estud. Astron. y Geofis. [Mexico], 2. ser., 4 (1944), No. 13, pp. 29–35*).

Evaporation at Portland, Maine, R. L. DAY (*Amer. Met. Soc. Bul., 25 (1944), No. 6, pp. 254–255*).—Data for 2 yr. are presented.

A method of measuring rainfall on windy slopes, G. L. HAYES (*Mo. Weather Rev. [U. S.], 72 (1944), No. 5, pp. 111–114, illus. 2*).—Conventional methods have proved inadequate for measuring rainfall on wind-swept mountain slopes, but a high degree of accuracy was found through use of sloped-orifice gages in pit exposure. It is believed that numerous rainfall measurements now made by the older technic could be made much more accurately by the methods here described. For example, in the selected storms considered during this study the conventionally installed gage at the windy 5,500-ft. south-slope station caught as little as 50 percent of the catch of the sloped-orifice pit-exposed gage; "measurements under such conditions by conventional installations can scarcely be sound aids to fire-control management."

Racer's storm (1837), with notes on other Texas hurricanes in the period 1818–1886, S. W. GEISER (*Field and Lab., 12 (1944), No. 2, pp. 59–67*).

Notes on the small tornado of May 24, 1941, at Brookline, Mass., S. PAGLIUCA (*Amer. Met. Soc. Bul., 25 (1944), No. 6, pp. 251–254, illus. 2*).—A comment by J. H. Conover is included.

Hurricane 1944 (*Forest and Park News, 8 (1944), No. 6, pp. 1, 4*).—A note on damage to shade and woodland trees on Cape Cod and in Plymouth and Bristol Counties, Mass.

Cloud and weather atlas, H. D. GRANT (*New York: Coward-McCann; Toronto: Longmans, Green & Co., 1944, pp. 294+, illus. 175*).—According to the foreword, by J. H. Kimball, "this atlas has been prepared with a view of aiding observers in the identification of the several cloud forms according to the International System of Classification. It is presented with the twofold purpose of stimulating interest in cloud study and of providing a compact volume of popular and practical interest."

When American seasons begin, S. S. VISHER (*Sci. Mo., 59 (1944), No. 5, pp. 363–369, illus. 10*).—This article presents nine original maps showing the dates of the beginning of various temperature seasons, based on the official computations of the daily normal temperatures, the average of day and night, for a 48-yr. period for 160 well-distributed Weather Bureau stations. The temperature limits selected to indicate the dates of the beginning of the seasons are those appearing appropriate, according to common opinion; as agreement is incomplete, however, alternative limits are presented in some instances.

Monthly Weather Review, [March–July 1944] (*Mo. Weather Rev.* [*U. S.*], *72 (1944) Nos. 3, pp. 63–88, illus. 48; 4, pp. 89–109, illus. 15; 5, pp. 111–134, illus. 12; 6, pp. 135–154, illus. 12; 7, pp. 155–170, illus. 10*).—In addition to meteorological, climatological, solar radiation, and sunspot data in each number and the paper abstracted on page 171, No. 3 contains a contribution on Maps of Percentage Frequencies of Very Dry, Moderate, and Very Wet Months, by S. S. Visher (pp. 63–70), and The Hail-Thunderstorm Ratio, by A. L. Shands (pp. 71–74); No. 4, Note on Advective Pressure Changes, by R. D. Elliott (p. 89); and No. 6, Nomographs for the Solution of Psychrometric Problems, by E. Berl and G. A. Sterbutzel (pp. 135-137).

Sinopsis meteorológica del año 1942 [Summary of meteorological observations at the Estación Exp. de Riego, Uruguay, for 1942], J. TISCORNIA (*Univ. Repub.* [*Montevideo*], *Rev. Facult. Agron., No. 35, (1944), pp. 51–89, illus. 5*).

A speculative interpretation of mid-Pacific weather, August 1–15, 1940, S. B. JONES (*Amer. Met. Soc. Bul., 25 (1944), No. 6, pp. 230–244, illus. 8*).

Climate and the energy of nations, S. F. MARKHAM (*London and New York: Oxford Univ. Press, 1944, rev. and enl., pp. 236+, illus. 14*).—The author's "inquiries into climatic, health, and energy factors have led to conclusions set out here, and these are then translated into terms of national assessments." The book does not pretend to have discovered all the causes of great civilizations, but it is hoped that it "will shed light on one cause—that of climate and man's growing control of it."

Climate, weather, and man, D. BRUNT (*Endeavour* [*London*], *3 (1944), No. 11, pp. 87–97, illus. 6*).

Climatological data for the United States by sections, [1943] (*Washington: U. S. Dept. Com., Weather Bur., Climat. Data, 30 (1943), Nos. 1–12,* [*about 240 pp., 9 illus. each*]; *13, pp.* [*290*], *illus. 33*).—Nos. 1–12 contain the usual brief summaries and detailed tabular statements of climatological data for each State for January to December, respectively. No. 13 summarizes for each State the data for each month of 1943 and for the year as a whole.

Notas sôbre a climatologia do Estado do Ceará [Notes on the climatology of the State of Ceará, Brazil], A. J. de Souza (*Bol. Min. Agr. [Brazil], 32 (1943), No. 6, pp. 49–65, illus. 8*).

The yield of streams as a measure of climatic fluctuations, W. G. Hoyt and W. B. Langbein (*Geog. Rev., 34 (1944), No. 2, pp. 218–234, illus. 4*).—The many records of stream flow now available not only provide information on water supplies but also a register of the related climatic factors. To those interested in climatic fluctuations or in defining relations between climatic elements and dependent geographic factors, analysis of the stream-flow records may furnish a valuable side light. To meet such interests, the results of analyses of more than 4,000 station-year records at selected gaging stations are here presented in a series of maps showing for the United States and Canada the percentage of normal stream flow year by year for 1911–42 and in tables the wet and dry indexes on an areal basis for the 5 wettest and 5 driest years.

A climatic discontinuity in the areal correlation of annual precipitation in the Middle West, E. E. Foster (*Amer. Met. Soc. Bul., 25 (1944), No. 7, pp. 299–306, illus. 4*).—This study was initiated in an attempt to determine the correlation of annual precipitation between Omaha and nearby Nebraska stations. Although the data introduced are not as complete as deemed desirable and there are more detailed correlations that should be worked out, the conclusion seemed inescapable that a relatively abrupt decrease in the values of the correlation coefficients marks the real climatic discontinuity found.

Annual growth of pines in the San Juan Basin, Colorado, as related to precipitation and streamflow, A. D. Moinat (*Tree-Ring Bul., 10 (1944), No. 4, pp. 29–30, illus. 1*).—Although it was impossible to derive climatic details from even more intricate tree-ring studies, it is concluded from the data presented on *Pinus ponderosa* that the climate of this basin has not differed greatly during the past 400–500 yr. from that covered by current weather records.

Correlation of microclimatic factors with species distribution in Shenk's woods, Howard County, Indiana, R. C. Friesner and C. M. Ek (*Butler Univ. Bot., 6 (1944), Papers 9–14, pp. 87–101, illus. 1*).—This is an analysis of a remnant of the primeval forest in which certain microclimatic factors seem to show a sharp if not causal correlation with the distribution of both woody and herbaceous plant species.

A new method of studying crop-temperature relationships, G. L. McColm (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20 (1941–42—1942–43), p. 24*).—An abstract.

Los insectos y el clima en Colombia (guión para un proyecto de investigación) [Insects and climate in Colombia (guide to an investigational project)], L. M. Murillo (*Rev. Nac. Agr. [Bogotá], 38 (1944), No. 479, pp. 25–28, illus. 1*). —With an accompanying map.

SOILS—FERTILIZERS

A catenary arrangement of the soils of Maryland, R. P. Thomas, A. W. Specht, and H. B. Winant. (Univ. Md.). (*Soil Sci. Soc. Amer. Proc., 7 (1942), pp. 487–495*).—A remapping having led to a practically quadrupled number of series names and created much confusion, the authors developed, for Maryland conditions, a chart or diagram of the soil series according to the parent material, drainage, and mode of formation. It is believed that this chart helps those working with these soils and shows the relationships among the different soil series. It is also suggested that much of the confusion caused by the detailed mapping might be overcome by a different method of selecting the soil series name.

Soil moisture in relation to plant growth, P. J. Kramer (*Bot. Rev., 10 (1944), No. 9, pp. 525–559*).—A comprehensive review of the problem, listing 108 references.

Soil management in relation to water penetration, M. R. Huberty. (Calif. Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 7, pp. 178–179, illus. 2*).—Consideration is given to the tillage operations, fertilizers, and soil amendments, and their effect on soil compaction, since soil compaction is directly related to soil structure and determines the rate of water entry into the soil. In order to avoid compaction during cultivation, the operator should select a time when soil moisture conditions are such as to support the equipment being used. When applying ammonium sulfate or sodium fertilizers, it is a good practice to apply a number of light applications rather than a large single application. However, should poor penetration result from the applications of these fertilizers, improvement can generally be accomplished by the addition of organic matter or calcium, or both.

Soil movement as affected by slope, discharge, depth, and velocity of water, J. F. Lutz and B. D. Hargrove. (Coop. U. S. D. A.). (*North Carolina Sta. Tech. Bul. 78 (1944), pp. 32, illus. 13*).—By means of a constructed water channel, illustrated in detail, laboratory studies were conducted using various-sized separates and various slopes and amounts of water to determine the relation between (1) slope, depth, and velocity, (2) slope and carrying capacity, and (3) depth and carrying capacity simulating a field plat undergoing sheet erosion. It was found that the discharge for any slope was equal to the product of depth and velocity. The velocity required to move a soil particle was not constant for all slopes, but varied with discharge, depth, and slope. In general, as the slope increased, depth decreased, thereby causing an increase in the velocity required to move the particles. The velocity required to cause initial movement of soil particles increases according to a fifth-degree equation as slope increases. This is contrary to general belief, but is explained on the basis of decreasing depth with increasing slope. Depth of flow is an important factor influencing initial movement and relative loss of soil particles. Since discharge of water is a linear function of velocity and slope, and since velocity is a function of discharge and slope, it follows that depth and velocity can be calculated for any given values of slope and discharge. Loss of the various particles is a function of slope and discharge, and the relative values of each factor vary with the size of particles. The greatest loss of soil occurs when the point of maximum velocity is at depths (from the surface upward) between the radius and diameter of the particles. The absolute values obtained in the laboratory probably would not apply directly to field conditions; however, they should apply relatively. Some mechanical analyses of eroded material from various-textured soils indicate that they do.

Moisture retention by some irrigated soils as related to soil-moisture tension, L. A. Richards and L. R. Weaver. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 6, pp. 215–235, illus. 8*).—A study of soil-moisture retention was made on 71 southern California soils by using porous ceramic and cellulose membranes. It was found that for 64 of the soils the 15-atmosphere (atm.) percentage lies in the wilting range. The soil-moisture tension at first permanent wilting for sunflowers was found for the majority of the soils to lie in the 7- to 9-atm. range. The soil-moisture tension at ultimate wilting was below 30 atm. for all but 3 of the soils, and 17 out of 24 soils tested underwent permanent wilting in the range from 20 to 30 atm. The moisture equivalent is the average value over approximately the 0.1- to 1.0-atm. tension range for a moisture-retention curve that takes into account centrifuge packing effects. Tensiometer, suction-plate, pressure-plate, pressure-membrane, or centrifugation apparatus may be used for determining equivalent negative pressure or soil-moisture tension; but, without disregarding osmotic effects, none of these can be used for determining free energy, or pF, if the latter is to be taken as a free-energy scale as originally proposed.

Are Utah farmers depleting their soils? D. W. THORNE (*Farm and Home Sci.* [*Utah Sta.*], *5* (*1944*), *No. 3, pp. 16–17, illus. 1*).—The results of a study by soil management students of the Utah College as to the balance of nutrients in the soils of their farms as related to cropping and fertilizer practices indicated that farmers in the region are removing essential plant nutrients from the soil in much greater quantities than they are being returned. A suggested program of soil management for a favorable soil balance is presented for irrigated farms.

Some relationship between soil type and fertility needs of Utah soils, H. B. PETERSON. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20* (*1941–42—1942–43*), *p. 4*).—The abstract presents the need for determining the fertility requirements of Utah soils and presents information that has been secured regarding certain soils over a period of years.

The role of microorganisms in soil conservation, T. L. MARTIN and D. A. ANDERSON (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20* (*1941–42—1942–43*), *pp. 4–5*).—Different kinds of organic matter were allowed to decompose, and at 20-day intervals the amounts of sugar, hemicellulose, cellulose, and lignin were determined. The different kinds of molds present were determined at 10-day intervals. The results seem to show that when the organic matter is first added to the soil *Rhizopus* and *Mucor* grow most readily. As the decomposition continues, Penicillia and certain Aspergilli develop more readily. Later, when there is a high percentage of lignins present, the dark-colored molds such as *Cladosporium, Alternaria,* and *Trichothecium* specifically predominate. These different molds were found to have a marked effect on soil aggregation. The *Cladosporium* was most effective, followed by the dark olive green *Aspergillus,* then the *Penicillium, Mucor,* and *Rhizopus,* in the order named.

Inhibitory plant growth factors in partially sterilized soils, R. R. ROBINSON. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36* (*1944*), *No. 9, pp. 726–739, illus. 3*). —Heavy applications of phosphate were effective in eliminating the deleterious effect of steam sterilization on certain soils. Even though phosphate was effective in correcting the difficulty, it was found that a deficiency of phosphate from fixation was not the cause of the inhibited growth. The trouble was thought to be due to a toxic concentration of some substance. Although this substance has not been identified, the evidence indicates that it is not nitrate, nitrite, ammonia, manganese, aluminum, iron, chloride, sulfate, or total soluble salts.

The duration of the incubation period was of minor consideration as compared with the temperature of incubation. The critical temperature appeared to be somewhere between 40° and 45° C. for a soil incubated wet. For a dry soil it was somewhat higher. In steam-sterilized soil, plant growth was about the same whether the soil was wet or dry during sterilization. Inoculation of heat-treated soil with untreated soil had little immediate effect on plant growth but very materially shortened the duration of the inhibiting effect. Of the crops tested, Ladino and red clover were particularly sensitive to injury; tomato, barley, and corn were intermediate; and ryegrass and buckwheat were not injured.

Absolute values in fertilizer experiments, O. W. WILLCOX (*Jour. Amer. Soc. Agron., 36* (*1944*), *No. 6, pp. 480–486, illus. 2*).—Another example of the use of the standard yield diagram in the interpretation of field experiments is presented and discussed. The author presents practical objections to the statistical method in the evaluation of results from certain agronomic experiments.

Factors affecting determination of acid- and base-forming quality of fertilizers, H. R. ALLEN and L. GAULT. (Ky. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 27* (*1944*), *No. 1, pp. 171–177*).—The investigation of acid- and base-forming quality of fertilizers was concerned with the relationship between the amount of dolomite and the amount of excess acid required to neutralize the dolomite, comparison of molar and 0.5 M sodium carbonate in the determination, comparison of the effect of ashing temperatures of 500° and 600° C., and the recovery of added coarser-than-20-mesh dolomite in mixed fertilizers as affected by sampling.

The effect of liming materials upon the solubility of potassium compounds in the soil, W. H. MacIntire. (Tenn. Expt. Sta.). (*Amer. Fert., 99 (1943), No. 13, pp. 7–9, 24, 26*).—Twenty-three yr. of lysimeter studies are presented on the amount of potassium leached from Cumberland silt loam when treated with limestone, dolomite, burnt lime, and burnt magnesia. The four liming materials caused a repression in the outgo of potassium in leachings during the first 12 yr. when only the liming material was added to the soil. Adding 166 lb. of potassium each year for the next 11 yr., for a total of 1,826 lb., resulted in a recovery of 1,138 lb. from the unlimed soil. The recovery of potassium from the unlimed soil was substantially greater than from the four liming materials. Potassium recoveries obtained were markedly repressed from acid Hartsells fine sandy loam when treated with limestone or dolomite. The repressive effect prevailed whether the potassium was added as nitrate, chloride, or sulfate.

In another study where burnt lime, magnesia, precipitated calcium carbonate, magnesium carbonate, 100-mesh limestone, 100-mesh dolomite, and 100-mesh magnesite were used at rates of 8-, 32-, and 100-ton equivalences of CaO, it was found that each liming material resulted in a decrease in the amount of potassium leached. The results thus indicate that heavy additions of any liming material will exert a repressive effect upon the solubility of the potassium content of the limed zone of the soil.

Susceptibility of exchangeable potassium in Hawaiian soils to loss by leaching, A. S. Ayres. (Hawaii Expt. Sta.). (*Hawaii Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *48 (1944), No. 2, pp. 83–92, illus. 2*).—This report covers a laboratory study of the effect of intensive leaching of four Hawaiian soils on soil potash. The soils were so selected as to differ widely in exchangeable potassium. Increased potassium leaching resulted when the samples were air dried. With soils having a high initial content of exchangeable potassium, the susceptibility of potassium leaching decreased with decreasing level of potassium in the soil. Greater losses of potassium were found to be associated with high initial levels of potassium saturation. Potassium lost from the soils ranged from 200 to 1,850 lb. of K_2O per acre-foot of soil. Levels of exchangeable potassium were reduced by leaching to from 30 to 80 percent of the original values.

Effect of waste sulfite liquor on aggregation of soil particles, R. B. Alderfer, M. F. Gribbins, and D. E. Haley. (U. S. D. A. and Pa. Expt. Sta.). (*Indus. and Engin. Chem., 36 (1944), No. 3, pp. 272–274*).—It has been estimated that the annual discharge of waste sulfite liquor in the United States is about 27 million tons, which means approximately 1,500,000 tons of lignin. In view of this potential source material, investigation was made of the effect of this waste material on soil structure and plant growth. The careful use of sulfite liquor gave a marked increase in the number of water-stable granules. The workers point out that "if this material is to be used as a soil amendment, the quantity to apply must be watched carefully, and intimate mixing with the soil particles must be insured. A few weeks at least should elapse before crops are seeded on soil so treated, in order to provide a suitable interval for soil organisms to decay the less resistant materials. To insure more rapid and thorough decomposition of these materials, the addition of an ample quantity of a well-balanced fertilizer mixture should precede the treatment. This mixture should carry from 40 to 60 lb. per acre of readily available nitrogen when the equivalent of 5 tons of dissolved solids are used."

Plant culture and other studies with some guanidine compounds, B. E. Brown. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 9, pp. 760–767*).—The nutrient values of diguanidine phosphate, triguanidine phosphate, diguanidine sulfate, and dicyanodiamide, which have been suggested as possibly possessing fertilizer value, are reported. Pot-culture experiments were conducted with millet, oats, and wheat. The guanidine salts were employed in greenhouse studies in different quantities, namely, 40, 80, 120, and 160 lb. per acre in 2–8–8, 4–8–8, 6–8–8, and 8–8–8 nutrient mixtures. Compared with a no-nitrogen mixture, 0–8–8, the nitrogen of the guanidine compounds proved to be fairly effective at the 40- and 80-lb. rates, but lowered the yields of all indicator crop plants when stepped up to 120 and 160 lb. of nitrogen per acre. These findings indicate that any attempt to use the guanidine salts as nitrogen sources would have to be made cautiously and limited to probably not more than 80 lb. of nitrogen per acre. In comparing the millet, oats, and wheat yields obtained with the guanidine salts with those from the urea and the ammonium sulfate-sodium nitrate-dried blood mixtures, the guanidine compounds generally were less effective throughout than the standard nitrogen sources. Nitrification and ammonification studies indicated that guanidine compounds and dicyanodiamide were not easily broken down.

Inspection of fertilizers, E. J. Deszyck and J. J. Havern (*Rhode Island Sta. Ann. Fert. Cir., 1944, pp. 24*).—This publication presents the usual analyses of fertilizers, for the 1943 season, according to the provisions of the Rhode Island inspection law. The text is by J. B. Smith.

AGRICULTURAL BOTANY

Agar resources of the South Atlantic and East Gulf coasts, H. J. Humm (*Science, 100 (1944), No. 2593, pp. 209–212*).—Following the author's preliminary announcement in 1942 (E. S. R., 88, p. 174), commercial agar production has become a reality during the past year along the North Carolina coast. The most abundant red alga of the region—*Gracilaria confervoides*—is now being harvested, dried, and sold by fishermen to processing factories; about 150,000–200,000 lb. of dry weed are estimated to have been gathered (Aug. 1, 1943 to Jan. 1, 1944), with a potential agar yield of 60,000 lb. or more, depending on cleanliness, yield, and thoroughness of extraction. Though not identical with that of *Gelidium* from California and Japan, the material from this alga is sufficiently similar to be referred to as agar. *Gracilaria* agar is more variable in temperature of gelation and usually somewhat higher than *Gelidium* agar. Although a recent coastal survey (1942–43) from the Eastern Shore of Maryland to Key West, Fla., revealed some agar-bearing resources in addition to that above noted, the region from Beaufort to Atlantic, N. C., seems to be the most valuable yet discovered on the Atlantic coast. Detailed results of this survey are presented, including experimental studies of other species of seaweeds encountered.

Air filters for control of air-borne bacteria, J. M. Dalla Valle (*Heating and Ventilating, 41 (1944), No. 4, pp. 54–59, illus. 3*).

Slime-producing coliform and coliform-like bacteria, J. R. Sanborn. (N. Y. State Expt. Sta.). (*Jour. Bact., 48 (1944), No. 2, pp. 211–217*).—The slimes produced by coliform bacteria in pulp, paper, and paperboard mills are formed by mucoid varieties of *Aerobacter aerogenes, A. cloaceae,* and *Escherichia coli,* with numerous intermediates. Examinations of 175 samples of such slimes showed *A. aerogenes* to be the principal organism present in 35, *A. cloaceae* in 59, and *E. coli* in 6 percent of the samples. Nonmucoid coliform bacteria were more readily controlled by chemical agents than the mucoid variants; slime-forming organisms developing in pulp and paper systems may ordinarily be killed with chlorinated water carrying a Cl residual of 1–2 p. p. m. Lethal activity may be considerably increased by suitable combinations of effective chemicals such as selected groups of chlorinated phenols. A number of compounds—including trichlorophenate fractions, metallic salts of chlorinated phenols, chlorinated isopropyl phenols, and alkyl derivatives of halogenated phenols—have proved useful in controlling coliform growths.

Substitution of thymine for "folic acid" in the nutrition of lactic acid bacteria, J. L. STOKES (*Jour. Bact., 48 (1944), No. 2, pp. 201–209, illus. 3*).—Thymine and its nucleoside, thymidine, substituted for folic acid in the growth of *Streptococcus lactis* R and related lactic acid streptococci, but at least 5,000 times more thymine was required than folic acid. Thymine possessed a high biological specificity, a large number of pyrimidine, purine, nucleic acid, and similar compounds being inactive. Adenine was necessary for maximum growth of *S. lactis* with either thymine or folic acid; guanine or xanthine could substitute for adenine but were less effective. Folic acid could not be detected in streptococcus cells grown in thymine medium. Similar results were obtained with three species of folic acid-requiring lactobacilli, but replacement of folic acid by thymine here was only partially effective. The theory is advanced that folic acid participates directly or indirectly as a coenzyme in the synthesis of thymine or a related compound in the lactic acid streptococci.

Enzyme formation and polysaccharide synthesis by bacteria.—II, Polysaccharide formation by Rhizobium radicicolum strains, H. G. BRAY, E. SCHLÜCHTERER, and M. STACEY (*Biochem. Jour., 38 (1944), No. 2, pp. 154–156*).—In the examination of various strains of this root nodule bacterium, Clover Bartel A was found most efficient for large-scale production. Experiments on methods for eliminating agar impurities indicated that use of cellophane was most satisfactory as to yield and purity of the polysaccharide formed.

Selective reversible inhibition of microbial growth with pyrithiamine, D. W. WOOLLEY and A. G. C. WHITE (*Jour. Expt. Med., 78 (1943), No. 6, pp. 489–497; also in Rockefeller Inst. Med. Res. Studies, 125 (1944), pp. 173–181*).—Growth of many microbial species was inhibited by pyrithiamine—the pyridine analog of thiamine; many others were not influenced. In a series of bacteria, yeasts, and molds, growth inhibition occurred only in those in which growth was stimulated by thiamine or its component thiazole and pyrimidine portions. The amount of pyrithiamine required for inhibition was correlated with the type of thiamine requirements of the various species. The least amount was needed to inhibit organisms requiring intact thiamine; those which could use the pyrimidine and thiazole portions were not so readily inhibited. In the case of the former group, half maximum inhibition was induced by as little as 0.03γ per cubic centimeter. In all cases the inhibition was overcome by sufficient amounts of thiamine. From a study of thiamine synthesis by insusceptible species, it was concluded that the formation of thiamine or other antagonistic substance did not provide an adequate explanation of the resistance of these species to the action of pyrithiamine.

Enzymatic synthesis of crystalline sucrose, H. A. BARKER, W. Z. HASSID, and M. DOUDOROFF. (Univ. Calif.). (*Science, 100 (1944), No. 2586, p. 51*). — On synthesis of sucrose by *Pseudomonas saccharophila.*

Tyrosine decarboxylation by streptococci: Growth requirements for active cell production, W. D. BELLAMY and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Bact., 48 (1944), No. 2, pp. 191–199*).—A synthetic medium—except for acid-hydrolyzed gelatin—was devised for growth of *Streptococcus fecalis* cells with an active tyrosine decarboxylation system. The growth requirements for decarboxylase production proved more specific than for a maximum cell crop. Niacin and pyridoxine were among the factors required in greater concentration for production of the tyrosine decarboxylation system than for growth. This may be a case of luxury consumption of specific nutrients for optimum functioning of the cells.

The production of carotenoid pigments from mineral oil by bacteria, H. F. HAAS and L. D. BUSHNELL. (Kans. Expt. Sta.). (*Jour. Bact., 48 (1944), No. 2, pp. 219–231, illus. 3*).—When a strain of *Mycobacterium lacticola* isolated from mud in contact with crude oil produced carotenoid pigments when cultured in a mineral salts medium with mineral oil as the sole organic constituent, analysis of the medium revealed four carotenoid pigments. Three were carotene pigments with spectrographic properties similar to that of β-carotene but with different degrees of chromatographic behavior and vitamin A activity. Though one of these pigments may be identified as β-carotene, the other two could not be identified and are believed to be isomers of β-carotene. A fourth pigment possessed chemical and spectrographic properties of astacin, an acidic carotenoid found primarily in crustaceans and hitherto never associated with carotenoids of *Mycobacterium* spp. Prolonged incubation effected spectrographic and quantitative changes in the pigmentation of these mineral oil cultures, the quantity of carotene pigments decreasing while the amount of astacin increased. There are 26 references.

Aerobic decomposition of guayule shrub (Parthenium argentatum Gray), J. NAGHSKI, J. W. WHITE, JR., and S. R. HOOVER. (U. S. D. A.). (*Jour. Bact., 48 (1944), No. 2, pp. 159–178, illus. 6*).—Aerobic decomposition of the crushed shrub was effected at 36°, 44°, and 52° C. for 1–3 weeks, the profuse microflora were tested for biochemical reactions, and the predominating organisms were identified. A 20–30 percent loss of dry weight, with marked disintegration of the woody tissues, was noted in 5–14 days. The disappearance of water-soluble carbohydrates and the existence of a saccharolytic flora were correlated with the markedly thermogenic phase of the first week; a mixed and neutral proteolytic flora followed during the second and third weeks. Fungi—primarily *Aspergillus fumigatus*—occurred in numbers of 10^5–10^6 per gram throughout the whole period. Organisms of major importance were: Saccharolytic—*Achromobacter lacticum, A. ubiquitum,* and *A. reticularum* (?); neutral—*Pseudomonas incognita, P. putida, A. alcaliaromaticum, A. candicans,* and *Actinomyces* spp.; and proteolytic—*P. aeruginosa, Flavobacterium fecale,* and *Bacillus subtilis.*

A drop method of penicillin production, S. A. SCUDDER (*Science, 100 (1944), No. 2591, p. 178*).—The method consists of culturing on a solid agar base containing constituents favoring a rapid production of penicillin in drops sufficient in size and quantity to be precipitated like rain on the opposing side of the container, when inverted. The material yielded is withdrawn by pipette and preserved anaerobically at 5° C.

Penicillin production, I. A. PEARL and J. W. APPLING (*Science, 100 (1944), No. 2586, p. 51*).—A note on the value of both sulfite waste liquor and corn steep liquor for penicillin production.

The production of penicillin by various fungi, J. W. FOSTER and E. O. KAROW (*Jour. Bact., 48 (1944), No. 2, p. 260*).—An abstract. *Aspergillus* spp. and *Penicillium citreo-roseum* are referred to in this connection.

Action of radioactive substances on the speed of growth of Penicillium notatum and the production of a potent penicillin, R. JAHIEL, E. GUBERMAN, and R. KAZDAN (*Science, 100 (1944), No. 2596, p. 298*).—The experiments briefly noted show the possibility of substantially decreasing the time required for the growth of *P. notatum* and for obtaining an active penicillin, tested in vitro, in the presence of radon and its deposits. It is believed that these radioactive substances act through their radiations rather than their chemical properties. Addition of a fluorescent material to the medium in which radioactive substances were present improved noticeably the effects of the latter.

Heterokaryosis in Penicillium notatum, G. E. BAKER (*Bul. Torrey Bot. Club, 71 (1944), No. 4, pp. 367–373, illus. 10*).—Conidia of *P. notatum* were found to be uninucleate and to germinate by 1–2 germ tubes. Anastomosis occurred freely among spores and hyphae, accompanied by nuclear division and nuclear migration. The assimilative hyphae were plurinucleate or binucleate, becoming uninucleate in the cells subtending the conidiophores. Phialides were uninucleate. The anastomosing of hyphae and spores in multiple spore transfers assures a combining of factors and heterokaryosis as spores with nuclei of different origins are brought together.

The yeast Nadsonia in America, J. N. Couch (*Jour. Elisha Mitchell Sci. Soc., 60 (1944), No. 1, pp. 11–16, illus. 22*).—A yeast isolated from the slime of a birch stump in North Carolina was identified as *N. fulvescens*—apparently the first record of this genus outside of Europe. Heterogamic conjugation, ascus formation, and the occurrence of asporogenous races are described.

The ferns and fern allies of Virginia, A. B. Massey (*Va. Polytech. Inst. Bul., 37 (1944), No. 7, pp. 110+, illus. 21*).—In addition to the annotated catalog—including localities (pp. 34–97), this popular manual includes a key to the species, a check list of Latin and common names, and brief consideration of the structure of the group, the fern garden, and fern herbaria. There are 24 literature references.

List of the flowering plants, ferns, clubmosses, mosses, and liverworts of Manitoba, C. W. Lowe (*[Winnipeg?]: Nat. Hist. Soc. Manitoba, 1943, pp. 110, illus. 2*).—An annotated list from ferns to composites arranged according to systematic plant groups, with supplementary lists of "plants which may be expected in Manitoba" and of mosses and liverworts, and an index to plant families.

Aquatic plants of the United States, W. C. Muenscher. (Cornell Univ.). (*Ithaca, N. Y.: Comstock Pub. Co., 1944, pp. 374+, illus. 554*).—Aquatic plants as interpreted in this manual are those which normally start in water and must grow for at least a part of their life cycle in water—either completely submersed or emersed; a few border-line species of bogs and marshes are also included. Woody plants are omitted, none being true aquatics. The general plan of the volume includes a key to the families with aquatic species, followed by a more detailed treatment of the several families; for each family there is a brief description, a key to the genera whenever more than one is discussed, a description of each genus, a key to the aquatic species in each genus containing more than one, and a statement of the general habitat and range of each species. Most of the species are illustrated and accompanied by maps indicating known distributions by States. A glossary and a subject index are provided.

Studies in Ohio floristics.—III, Vegetation of Ohio prairies, C. H. Jones. (Ohio State Univ.). (*Bul. Torrey Bot. Club., 71 (1944), No. 5, pp. 536–548, illus. 5*).—The main purpose of this paper in the series[1] "is to present a list of the plants which occurred on the prairie areas of Ohio at the time of settlement." These central Ohio areas consisted for the most part of a complicated mosaic of grasslands interlaced with tree-bordered streams, swamp forests, swales, and isolated prairie groves on some of the better-drained sites. Between these outliers of the true prairie of the interior lowland and the forests of the plateau, there existed an irregular discontinuous zone of small areas populated with prairie grasses and with forbs of the deciduous forest. The list presented of plants believed to be representative of the species characteristic of Ohio's prairies consists of *Andropogon furcatus, A. scoparius, Sorghastrum nutans,* and *Spartina michauxiana* as dominants and some 103 species as subdominants. Other lists include plants frequently associated with these prairie dominants at the edge of forests and on over-exposed and over-drained areas; plants of general distribution frequently occuring in these prairie areas; and trees and shrubs often bordering dry prairie areas or occurring as scattered specimens. Some eight factors which have influenced the present-day vegetation cover of many of the formerly cultivated and now abandoned tracts are enumerated and discussed. Two plant successions representative of the vegetation changes frequently occurring on these abandoned areas are presented and briefly discussed, in addition to lists of herbaceous plants often present in these disturbed areas and of trees and shrubs which begin to appear in various combinations after a few years. Man has played various roles in relation to the prairies of the State. In some parts he has destroyed or greatly altered the existing vegetation; in others he has been the indirect cause of secondary prairies—prairies which frequently exist for only a few years and are then succeeded by the invading forest.

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[1] Amer. Midland Nat., 26 (1941), No. 3, pp. 674-689, illus. 4.
Castanea, 8 (1943), No. 5-6, pp. 81-108.

Additions to the revised catalogue of Ohio vascular plants, XII, C. H. JONES. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 4, pp. 188–191*).—This includes an annotated list of additions to the State herbarium (E. S. R., 90, p. 27) during 1943.

Juniperus virginiana, J. horizontalis, and J. scopulorum.—I, The specific characters. II, Hybrid swarms of J. virginiana and J. scopulorum, N. C. FASSETT. (Univ. Wis.). (*Bul. Torrey Bot. Club, 71 (1944), Nos. 4, pp. 410–418; 5, pp. 475–483, illus. 6*).—A study on mass collections made throughout much of the ranges of these three species, as well as on herbarium material, indicated that they are always clearly recognizable on a number of characters, except that when two species grow together the variation within each species is often more conspicuous than—but never as constant as—the variation which separates species; and that many of the distinguishing features—though perfectly practical for the taxonomist—are nevertheless statistical in nature. Where one of these two species grows by itself, it was found to retain pure specific characteristics, except in areas in the western part of the range of *J. virginiana* where certain tendencies toward *J. scopulorum* suggest an ancient incursion of that species. Where the ranges of the two meet, all recombinations of the characters of each occurred in individuals of one colony.

A new species of Orcuttia from Baja California, J. R. SWALLEN. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 9, p. 308*).—*O. fragilis* n. sp. is described. "An abundant forage grass over the great flood plain following rain storage. Reported excellent for cattle."

Some statistics of Achras zapota leaves, British Honduras, F. E. EGLER (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 235–245, illus. 1*).—The taxonomic status of the sapodilla tree complex—source of chicle and forming an industry of considerable importance in Central America—is said to be in need of further investigation. The characterization here given of the leaves in a random population of 35 trees, as expressed by means, ranges, standard deviations, and standard errors, represents estimates of the normal variation of the species. Such statistics can serve as a basis of reference for the future study of variation in normal *Achras* leaves in other parts of tropical America, especially with regard to other populations that may be thought to differ significantly. Until then it may be assumed that the differences are only incidents of sampling from a normally variable population, and that the "zapote blanco," "zapote colorado," and "zapote morado" are conspecific.

The woody smilaxes of the United States, W. C. COKER (*Jour. Elisha Mitchell Sci. Soc., 60 (1944), No. 1, pp. 27–69, illus. 166*).—This monographic systematic study includes keys to the species (general, habitat, and underground parts) and new taxonomy.

Swamp-grown eastern white pine and hemlock in Connecticut as dendrochronological material, H. J. LUTZ (*Tree-Ring Bul., 10 (1944), No. 4, pp. 26–28, illus. 1*).—Close agreement of years of maxima and minima were found for trees growing in a swamp in the Yale Forest with those obtained for the same species in Massachusetts and New Hampshire by Lyon (E. S. R., 90, p. 57) and by Avery et al. for hemlock near New London, Conn. (E. S. R., 85, p. 355). The conclusions thus seem warranted that even trees developed in a swamp habitat may have dendrochronological value, and that in addition to precipitation and temperature there may be other factors or factor complexes of widespread occurrence which influence tree growth in rather diverse habitats. The possibility of discovering general regionally operating controls of tree growth other than those regularly recognized should be borne in mind by investigators of tree rings.

Notes on dendrochronologies at the Arnold Arboretum, E. SCHULMAN (*Tree-Ring Bul., 10 (1944), No. 4, pp. 30–32*).—The notes presented concern some general features of the chronologies of *Cedrus libani, Juniperus virginiana,* and *Tsuga canadensis* in this arboretum near Boston, Mass.

Problems in tree nutrition: An account of researches concerned primarily with the mycorrhizal habit in relation to forestry and with some biological aspects of soil fertility, M. C. RAYNER and W. NEILSON-JONES (*London: Faber & Faber, 1944, pp. 184, illus. 134*).—This volume is largely an assemblage of research papers by the authors published at intervals between 1934 and 1941 and having to do with investigations on the genus *Pinus,* with an account of experimental work in a selected area, organic composts and the growth of young trees, studies of mycorhizal response in *Pinus* and other conifers, and the biological aspects of soil fertility. A list of 58 references, a glossary, and a subject-author index conclude the work.

Mycorrhizal symbiosis in Aplectrum, Corallorhiza, and Pinus, D. T. MACDOUGAL and J. DUFRENOY (*Plant Physiol., 19 (1944), No. 3, pp. 440–465, illus. 9*). —The results of a comparative study of the endophytic mycorhizas of terrestrial orchids and of the ectendotrophic mycorhizas of pines are presented, and the possible mutative origin and vegetative propagation of "stem-mycorhizas" as exemplified by *Aplectrum* are described. Association of pines with symbiotic fungi could not be connected with any heritable morphological alterations. Short lateral rootlets are invested directly by hyphal branches of mycelia in the soil; such association may not be made until the second season. No plants of *Corallorhiza* with roots or other than stem mycorhizas were seen. The mycelium of the endophytic mycorhizas is in the cortex; in its growth it keeps pace with the differentiating meristem. Symbiotic fungi of other terrestrial orchids with roots traverse these organs in a similar manner, sending hyphae out into the soil through the durable root hairs and other epidermal cells. Absorption of inorganic P from the soil by the fungus and the stages in its metabolism terminating in the root stele, identifiable origination in hyphae and translocation of auxin, vitamins, and amino compounds to the root tissues, together with the capacity of isolated segments of mycorhizal roots to survive and grow like a chlorophylless plant, establish the nonparasitic character of the fungus.

The hyphal distribution in the cortex of pines did not extend beyond the endodermis in which catechol tannins are formed; the middle lamellae of the outer cortex is traversed and its disintegration products are available for absorption. Palmated branching hyphae enter the cortex and become closely engaged with a cytoplasmic mass characterized by minute vacuoles suggesting an exchange mechanism. Hydrolyzation products of polyuronides, starch, and other diffusible compounds may be absorbed by the fungus. The mycelium of the endophytic mycorhiza advancing toward the growing apex of coralloid branches forms dense swirls of hyphae enveloping the nucleus, which is hypertrophied and densely granular, constituting an arrangement for possible exchanges. The hyphal masses disintegrate in older parts of the stem, their contents becoming available to still living cortical cells. Layers and islands of cells containing oxidized catechol form a barrier to hyphal extension. Hyphae of the fungus partner and the cells of the symbiotic seed plant are richly endowed with mitochondria giving reactions for phospholipids. The cells of the higher plant also include plasts which may be differentiated to synthesize proteins or starch; these capacities are exhibited by the plasts of isolated pine roots in soil cultures. Carbohydrate metabolism occurs mainly in cortical cells and in the presence of plasts. Auxins and vitamins are accumulated by or originate in the hyphae and are translocated to the roots. Pads of material at the pores of cross walls in the hyphae were observed; the possible similarity in composition and function to the sieve plates of higher plants is noted. The limited initial growth of the short laterals of pine roots which become invested by the mycelium of the symbiotic fungus may be connected with the lack of cytochrome oxidase which is active in the meristem of rapidly elongating leaders. The subsequent profuse coralloid branching of the short roots is in the presence of such oxidases produced by the hyphae. The phenolic compounds in the pericycle and endodermis which are firmly held in suspension or solution in the vacuoles or coacervated into spherical masses with a phospholipidic membrane in the endodermis and pericycle are neutral to the protoplasm in these elements. When allowed to escape from the vacuoles these phenolic substances oxidize to tannin, which "fixes" the protoplasm as seen in the brown peripheral layers of old mycorhizas. There are 21 references.

Bacterial leaf nodules: An approach to a little known phenomenon in plant structure, H. J. Humm (*Jour. N. Y. Bot. Gard., 45 (1944), No. 537, pp. 193–199, illus. 3*).—The author presents a brief summary (with selected references) and discussion of these little-understood nodules occurring in the leaves of certain tropical shrubs; over 370 species in 5 genera and 2 families are known to have leaf nodules formed by bacteria which have never been found outside the tissues of these plants. The life of every individual plant of all these species seems to depend on the bacteria, which live symbiotically in all the leaves. "The problem of bacterial leaf nodules in tropical shrubs offers a challenge to agricultural bacteriologists."

Sobre algunos problemas de fisiologia y ecologia del tabaco que se presentan en zonas tabacaleras del norte Argentino—nota primera [Some problems in the physiology and ecology of tobacco encountered in the tobacco region of northern Argentina—preliminary note], A. S. Colla (*Arch. Biol. Veg. Teórica y Aplicada [Buenos Aires], [1] (1943), [No. 1–2], pp. 3–24*).—The area concerned includes the provinces of Salta and Corrientes and the territory of Misiones. There are over seven pages of references.

Vitamin requirements of lactose-fermenting and certain other yeasts, M. Rogosa. (U. S. D. A.). (*Jour. Bact., 47 (1944), No. 2, pp. 159–170, illus. 9*).—The studies were undertaken to determine the requirements of lactose-fermenting yeasts and some strains of *Saccharomyces cerevisiae* for exogenous vitamin sources. The strains of *S. cerevisiae* tested required exogenous inositol, thiamine hydrochloride, pyridoxine hydrochloride, *d*-Ca pantothenate, and biotin, for early, rapid, and optimal growth. External sources of pantothenic acid, biotin, and, with one strain, thiamine hydrochloride were critical factors for growth even during extended incubation.

Lactose-fermenting yeasts required exogenous inositol, thiamine hydrochloride, *d*-Ca pantothenate, biotin, and nicotinic acid or nicotinamide, for early, rapid, and optimal growth. External sources of pantothenic acid, biotin, nicotinic acid or nicotinamide, and, for many strains, thiamine hydrochloride were critical factors for growth even during extended incubation. Lactose-fermenting yeasts and the strains of *S. cerevisiae* tested did not grow in a medium free of vitamins during incubation for 68 hrs. Growth became extinct, or sparse, delayed and abnormal during serial passage in a medium free from vitamins, regardless of the duration of incubation.

Action de l'aneurine sur les cultures de racines et sur les cultures de tissus de carotte [Action of thiamine on root cultures and on tissue cultures of carrot], P. Nobécourt (*Compt. Rend. Acad. Sci. [Paris], 216 (1943), No. 26, pp. 902–904*). —Evidence is presented that thiamine fails to replace indoleacetic acid in tissue cultures of carrot, whereas cultures of excised carrot roots are able to perpetuate themselves only in the presence of thiamine in the nutrient medium.

Effect of different concentrations of synthetic auxins on decapitated sunflower stems, S. Kelly (*Bul. Torrey Bot. Club, 71* (*1944*), *No. 5, pp. 549–554, illus. 3*).—"Synthetic auxins dissolved in lanolin and applied to the decapitated stumps of sunflowers produced three responses—lateral bud inhibition, gall formation, and epinasty. Naphthaleneacetic acid [NAA] also produced stem thickening below the second node. The concentrations necessary to bring about gall formation and bud inhibition were lower, in general, than those necessary to produce epinasty, when measured 10 days after the first application. At threshold concentrations, [NAA] (0.002 and 0.006 percent) was most effective in producing bud inhibition and epinasty, and indoleacetic acid (0.004 percent) was the most effective gall former. As compared with NAA, IBA [indolebutyric acid] was less effective in inhibiting lateral buds and more effective in producing galls. Indolepropionic acid produced large galls but was not especially effective in producing the other two responses. Except in higher concentrations, phenylacetic acid was ineffective in producing bud inhibition and epinasty; 0.3 percent produced galls, but concentrations of 10 percent and higher destroyed the plant tissues."

The use of some unsaturated compounds to induce abscission, N. G. Arrillaga and M. A. Jones. (P. R. Fed. Expt. Sta.). (*Amer. Perfumer and Essential Oil Rev., 46* (*1944*), *No. 9, p. 49*).—In the search for a chemical treatment—noninjurious to the plant—which would provide a method of harvesting plant parts from which essential oils or other compounds are to be extracted, ethylene was found to induce abscission of the flowers of ilang-ilang (*Canangium odoratum*) and Chinabox jasmin orange (*Murraya exotica*). Acetylene and CO failed to do so for ilang-ilang.

La composition ionique des végétaux et la température de culture (rôle thermorégulateur des cations alcalins et alcalino-terreux) [The ionic composition of plants and the temperature under which they are grown (the thermoregulatory role of cations of the alkalis and alkaline earths)], E. Bachrach (*Compt. Rend. Soc. Phys. et Hist. Nat. Genève, 60* (*1943*), *No. 3, pp. 223–227*).—As based on the findings of chemical analyses, the author concludes that in nature the chemical factors enabling organisms to resist environal temperatures are preponderantly the salts of alkalis and alkaline earths. As he had previously shown for animals, a high saline concentration proved also an indispensable factor in enabling adaptation to high temperatures in plants. Although the preponderant cation in animals is Na and that in plants is K, it is claimed that it is the ratio between these two cations which regulates the temperature of the vertebrate animal and the resistance of all living things—plant and animal—to environal temperatures. There is also a direct relation between the sugar content of fruit and the temperature under which the plant has been grown. Studies in progress are believed to explain the mechanism of action of these chemical thermoregulatory factors.

Developmental responses in isolated plant tissue systems, P. R. White (*Growth, 6* (*1942*), *Sup., 4. Symposium Devlpmt. and Growth, pp. 55–71, illus. 6*).—This paper was presented at the Fourth Symposium on Development and Growth to introduce the subject of response to formative agents—both chemical and physical—insofar as higher plants are concerned. In any analysis of developmental response the investigator seeks to eliminate one by one the differential stimuli until he obtains as nearly as possible an indifferent or at least completely regular response, and then to add known and controllable stimuli, observing the resulting changes in response. It is for this reason that the isolation and maintenance of uniform undifferentiated patternless masses of tissue as a basis for developmental studies take on such importance. The author reviews (15 references) the general problem of morphogenesis in plants and of the development of the tissue culture technic, as well as some of the results of his studies through use of this method. It seemed probable that materials which had already escaped somewhat from the normal morphogenetic bonds might prove more satisfactory than excised roots for preliminary studies along these lines. Such materials presented themselves first in the rapid-growing disorganized galls, regularly appearing on plants of the hybrid *Nicotiana langsdorfii* × *N. glauca.* Another suitable material was found in the secondary galls—not containing bacteria and thus indirectly induced by the presence of bateria elsewhere in the host—arising on sunflower inoculated with *Phytomonas tumefaciens.* Finally, the author presents one set of evidence indicating the feasibility of evoking new or restoring lost patterns in these experimental materials. When the *Nicotiana* galls were grown at the surface layer between nutrient and air, tissue growth was disorganized; when grown deep in the nutrient liquid they rapidly developed green pigment, and their surface layers became organized by well-oriented sequences of cell divisions into numerous typical growing points developing into typical plantules. These reactions were completely reversible, depending on the position with respect to the interface; strong evidence points to the conclusion that this morphosis is an aerogenous one. Here, then, is a well-defined morphosis which can be controlled and manipulated at will as an experimental tool in the study of such phenomena; it is believed that many other such manipulable morphoses will be found which will lead to a much sounder insight into the causes of the multitudinous variations in form and function characterizing living organisms.

The investigation of plant nutrition by artificial culture methods, D. I. ARNON and D. R. HOAGLAND. (Univ. Calif.). (*Biol. Rev. Cambridge Phil. Soc., 19 (1944), No. 2, pp. 55–67*).—This review (126 references) presents a general survey of the subject. Several types of culture are described, including liquid culture methods and those depending on a solid inert medium. The advantages of artificial culture procedures for growing plants are pointed out, as one means of studying soil-plant interrelations, as well as various questions in the physiology and biochemistry of plants. These technics have proved indispensable in investigating the chemical elements essential to growth in the higher plants, especially those needed in only minute amounts. These methods are also highly valuable for studying the absorption of ions by roots, and they serve for inquiries into the interreactions of climatic conditions and mineral nutrients. Among other topics considered are the applications of these methods to researches on the functions of inorganic nutrients in plant metabolism, the role of colloids in ion absorption, horticultural and agronomic problems, and commercial production of crops (e. g., hydroponics).

The behavior of excised roots of heterotic hybrids and their inbred parents in culture, W. G. WHALEY and A. L. LONG (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 267–275, illus. 3*).—Excised roots of tomato and corn were grown in Pfeffer's solution containing separately thiamine; thiamine and pyridoxine; and thiamine, pyridoxine, and nicotinamide. In cultures containing thiamine the roots of one inbred strain of tomato—Pritchard—responded better to added pyridoxine; those of the other—Red Rover—to added nicotinamide. The hybrid roots were better than those of either of the inbreds in all media used. Excised corn roots showed progressive growth diminution in successive passages in all media. The hybrids showed more growth in each of six passages, as well as greater average growth, than the inbreds. In cultures containing thiamine the parents and hybrids of one cross exhibited increased growth in presence of pyridoxine but decreased growth in presence of pyridoxine and nicotinamide in the concentration used; the roots of the other cross reacted in like manner but less consistently. It is suggested that the hybrid advantage originated in its more efficient metabolism, giving the hybrid roots greater ability to synthesize and/or utilize certain substances.

Calcium and other polyvalent cations as accelerators of ion accumulation by excised barley roots, F. G. VIETS, JR. (Univ. Calif.). (*Plant Physiol., 19 (1944), No. 3, pp. 466–480, illus. 11*).—A systematic study of K and Br absorption as

influenced by polyvalent cations was made with excised roots capable of accumulating large amounts of K and Br in a short time. Contrary to the concept of antagonism deduced from experiments conducted usually with high salt concentrations on material incapable of active aerobic metabolism, these studies indicated that a variety of polyvalent cations accelerate K and Br absorption, Ca being most effective. A ratio greater than 30 Ca ions to 1 K ion in the solution was necessary before K absorption could be depressed below absorption from pure KBr. Ca, Mg, Sr, Ba, and Al were effective in increasing K and Br absorption, but no regular series of efficiencies could be determined. Mixtures of $CaSO_4$ and $MgSO_4$ produced increases in absorption of the same magnitude as did these salts used alone with KBr, indicating that the polyvalent cations are performing the same common function with different degrees of efficiency. The influence of Ca on ion absorption in its relationship to the increased respiration and sugar loss is discussed, and the difficulty of separating primary and secondary effects is noted. Roots grown with different Ca supplies responded similarly to the presence of Ca in the KBr solution during subsequent ion absorption. Absorption of K and Br from relatively high concentrations of KBr could not be accelerated by Ca when the roots were deprived of O_2 or treated with KCN. The effect of Ca on K and Br absorption was apparent over a wide temperature range. Two interpretations of the data are considered, and the difficulties of separating metabolism from permeability in discussions of ion accumulation are reemphasized.

Some effects of boron supply on the chemical composition of tomato leaflets, R. Q. PARKS, C. B. LYON, and S. L. HOOD. (U. S. D. A.). (*Plant Physiol., 19 (1944), No. 3, pp. 404–419, illus. 3*).—A brief review of the literature (55 references) indicated striking disagreement as to the effects of B supply on the mineral content of plants. This investigation, run under carefully controlled conditions, was undertaken in an effort to elucidate this relationship. In the two experiments reported upon, using tomato plants grown in sand culture, the concentrations of K, Ca, Mg, S, Na, P, N, Mo, Cu, Mn, Zn, Fe, Co, and B were employed as criteria of chemical concentration. As the B supply was increased, its concentration in leaflet material became significantly increased. There were also large differences among treatments with respect to the concentration of most of the other elements examined as the B supply was increased, the concentration of some elements being altered as much as several hundred percent. The results offered a possible explanation for the confusion existing in the literature. For instance, reports of trends involving increased Mg, Ca, or K concentrations, or decreased Mg, Ca, or K concentrations associated with increased B supply could all be supported by these data if different initial levels of B supply were assumed. It was evident that the B supply had specific effects with respect to different elements, since the trends shown in plant composition for varying B supplies were completely dissimilar for different elements. Differences among trends shown for various elements could not be correlated with type of ion (cation or anion), valence of ions, or total growth of plants. The possible importance of these effects with respect to plant nutrition and to the nutritive value of food crops is discussed.

The translocation of potassium among peach roots, O. W. DAVIDSON. (N. J. Expt. Stas.). (*Soil Sci., 58 (1944), No. 1, pp. 51–59, illus. 6*).—By use of special double-chambered sand cultures which enabled the separation of peach roots into two distinct horizontal layers, it became possible to apply K to one layer of roots without contaminating the others. Results via this method indicated that K may be absorbed by one layer of roots and translocated vertically up or down through the root system rapidly and in considerable amounts to other roots receiving no external supply of this element.

Response of Pythiomorpha gonapodyides to manganese, W. J. Robbins and A. Hervey (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 258–266, illus. 2*).—Failure of the fungus *P. gonapodyides* to grow in a basal solution composed of $MgSO_4$, KH_2PO_4, asparagine, and dextrose (C. P.) plus synthetic thiamine was found due to lack of Mn. *Phycomyces blakesleeanus* and *Aspergillus niger* grew quite satisfactorily through four successive passages in the basal medium. Addition of Zn and Fe—singly or together—to the basal medium failed to induce growth in *Pythiomorpha;* Zn was beneficial in presence of Mn.

Torulopsis utilis and the citric acid cycle, E. Sperber (*Nature* [*London*], *154 (1944), No. 3899, pp. 116–117, illus. 2*).—The experiments described suggest that although the enzymes of the citric acid cycle are possibly not normal constituents of this yeast, they can be synthesized under certain conditions.

The metabolism of starving leaves.—V, Changes in amounts of some amino acids during starvation of grass leaves and their bearing on the nature of the relationship between proteins and amino acids, J. G. Wood and D. H. Cruickshank (*Austral. Jour. Expt. Biol. and Med. Sci., 22 (1944), No. 2, pp. 111–123, illus. 6*).—In this installment of the series (E. S. R., 91, p. 395) the amounts of various free amino acids and other nitrogenous compounds, as well as respiration rates and carbohydrate contents, were determined in leaves of Kikuyu grass and animated oats starved in atmospheres of N and air. In the grass leaves starved in air transformations of N compounds were accounted for by hydrolysis of proteins to amino acids followed by their oxidation to asparagine and NH_3. Though these processes also occurred in oats they differed in the formation of undetermined N compounds during late stages of starvation, in peptide accumulation, in more extensive break-down of protein, and in secondary formation of glutamine. During starvation in air, amino acids were preferentially oxidized; during starvation in N, very little break-down of protein and accumulation of amino acids occurred unless the leaves were injured, only amino acids accumulating and with no formation of asparagine or NH_3.

Data from previous papers by the authors and others (29 references) were investigated in the light of these findings, with the following conclusions: The presence of a pattern in which proteins, pigments, phosphatides, and ascorbic acid are interlocked components provides steric hindrance which prevents protein hydrolysis in N. In air all components of the pattern are subject to oxidation to a degree depending on the rate of carbohydrate oxidation; the dynamic character of the pattern in air allows enzymes to come into contact with their protein substrate. The relations between protein and total amino acid concentration can be expressed by a curve concave to the amino acid concentration axis, at least part of the concavity resulting from the fact that some amino acids are oxidized more rapidly than others. A reversible relation between protein and amino acids is implied, modified by preferential oxidation of some amino acids. The curve relating protein and amino acid content is not directly affected by respiration rate, but the views of various workers harmonize with the theory that protein content is determined by the rate at which carbohydrates are utilized in an oxidation cycle. It is suggested that maintenance of a definite protein level depends on whether syntheses of the most readily oxidized amino acids from carbohydrates and N substrates occur at a rate at least equal to their rates of oxidation.

Concurrency of carbohydrate formation and carbon dioxide absorption during photosynthesis in sunflower leaves, J. H. C. Smith (*Plant Physiol., 19 (1944), No. 3, pp. 394–403, illus. 2*).—"Sunflower leaves during photosynthesis accumulate an amount of carbohydrate equivalent to the amount of carbon dioxide absorbed. If other classes of substances are formed, they must accumulate in only very small quantities. Starch and sucrose plus monosaccharides increase in direct proportion to the amount of carbon dioxide absorbed during photosynthesis. The relationship between the amount of carbon recovered as starch and as sucrose plus monosaccharides indicates that starch and sucrose are formed concurrently in side-by-side reactions, and that the sucrose is subsequently inverted to monosaccharides. The possibility exists that sucrose and starch arise from a common precursor. Other carbohydrate fractions, which are formed in only minor amounts, apparently increase also in proportion to the amount of carbon dioxide absorbed. One fraction, the residue fraction, is increased by treatment of the leaf in the dark with carbon dioxide. This increase becomes progressively less as photosynthesis progresses until, in prolonged photosynthesis, an actual decrease in the residue is produced. If the course of the synthesis of the various carbohydrates from a common precursor, as presented here, is confirmed, a new aspect of the sequence of carbohydrate formation will have been gained." There are 19 references.

Studies of the inner and outer protoplasmic surfaces of large plant cells.—II, Mechanical properties of the vacuolar surface, W. J. V. OSTERHOUT (*Jour. Gen. Physiol., 28 (1944), No. 1, pp. 17–22, illus. 1*).—In this installment of a series of studies (E. S. R., 90, p. 604), the vacuolar surface of the alga *Nitella* is found to be covered with a nonaqueous film too thin to be visible as a separate membrane. The protoplasmic motion may subject this film to a good deal of mechanical disturbance; apparently, however, this does not rupture the film, for no dye escapes into the protoplasm as a result of such disturbance when the vacuolar sap is deeply stained with a neutral red or brilliant cresyl dye. When the deeply stained central vacuole breaks up into several smaller vacuoles, leaving the outer protoplasmic surface in its normal position, there is still no evidence of dye escaping into the protoplasm through this film.

Differing rates of death at inner and outer surfaces of the protoplasm, I, II, W. J. V. OSTERHOUT (*Jour. Gen. Physiol., 28 (1944), No. 1, pp. 23–36, illus. 2; pp. 37–42, illus. 2*).

I. *Effects of formaldehyde on Nitella.*—When protoplasm dies it becomes irreversibly and completely permeable; this may be used as a criterion of death. On this basis it may be said that when 0.2 M formaldehyde plus 0.001 M NaCl is applied to the alga *Nitella,* death comes sooner at the inner than at the outer protoplasmic surface. If, however, 0.17 M formaldehyde plus 0.01 M KCl is applied, death arrives sooner at the outer protoplasmic surface. This difference appears due largely to the conditions at the two surfaces. With the above concentrations of formaldehyde and NaCl the inner surface is subject to a greater electrical pressure than the outer and is in contact with a higher concentration of KCl. In the other case these conditions are more nearly equal so that the layer first reached by the reagent is also the first to become permeable. The outer protoplasmic surface is able to distinguish electrically between K^+ and Na^+ (potassium effect); under the influence of formaldehyde this ability is lost, due chiefly to a falling off in the partition coefficient of KCl in the outer protoplasmic surface. At about the same time the inner protoplasmic surface becomes completely permeable, but the outer surface retains its ability to distinguish electrically between the different concentrations of the same salt, showing that it has not become completely permeable. After the potential has disappeared the turgidity persists for some time, probably because the outer protoplasmic surface has not become completely permeable.

II. *Negative potential in Nitella caused by formaldehyde.*—In the preceding section it was shown that when the inner protoplasmic surface has lost its potential under the influence of formaldehyde the outer surface can still respond to changes in concentration of electrolytes. It is here indicated that after the inner surface has lost its potential there may be a sudden development of negative potential at the outer surface due to substances coming out of the sap and combining with formaldehyde.

Multiple embryos in the avocado, C. A. SCHROEDER. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 7, pp. 208–210, illus. 2*).—No evidence of nucellar embryony such as occurs in citrus and mango has been noted thus far in avocado. All the multiple embryos here reported apparently arose from gametic tissue. They may be "identical" or "fraternal" but are not to be confused with "vegetatively reproduced" nucellar seedlings.

The function and structure of the parenchyma sheath plastids of the maize leaf, M. M. RHOADES and A. CARVALHO (*Bul. Torrey Bot. Club., 71 (1944), No. 4, pp. 335–346, illus. 8*).—The parenchyma sheath cells enclosing the vascular bundles of corn leaves contain specialized plastids—green in color—concerned with elaborating starch. The starch grains are formed in definite vacuole-like regions in the plastid, which may have as many as 40 starch grains. Starch is deposited in these plastids only when the rate of movement of sugar from the mesophyll cells into the bundle sheath cells is greater than its rate in passing from the sheath cells into the vascular elements. The bundle sheath plastids deposit starch increasingly during the day; at night it is hydrolyzed to soluble carbohydrates and translocated so that the plastids are free of starch by morning. No starch was found in the mesophyll plastids at any time—day or night. The bundle sheath plastids or sorghum are similar in function to those in corn; this specialization may be typical of the subfamily Panicoideae. The parenchyma sheath plastids of wheat, oats, and barley—all members of the subfamily Pooideae—differ in size and function from those in corn and sorghum.

Comparative structure of green leaves of oriental tobacco at different levels on the stalk in relation to their quality upon curing, F. A. WOLF and E. F. JONES (*Bul. Torrey Bot. Club, 71 (1944), No. 5, pp. 512–528, illus. 3*).—In this study—involving five varieties representing the most important types—leaf size was correlated with stalk position, the largest leaves occurring toward the base. Leaf size was also correlated with constituent cell size, the largest leaves having the largest and most loosely arranged cells. Leaves borne at different stalk positions may differ in shape. Such variations, interpreted as a compensatory response to priming, were progressively greater as harvesting proceeded; difference in stalk position of leaves was also correlated with differences in amount of leaf–tissue constituents. The population density of glandular hairs increased with decrease in leaf size; the smallest leaves on a plant may have 2–5 times as many hairs per unit surface area as the largest. Since the largest leaves occur toward the base of the stalk, there is a direct correlation between structure and quality. The proximate causes of differences in quality of oriental tobaccos are complex, but combustibility and aroma are well known to be the most highly prized attributes. Combustibility—not directly tested here—appears to depend mainly on leaf texture, i.e., constituent cell size and chemical composition; aroma—approached as a problem of leaf structure—seems to be traceable primarily to the exudate from glandular hairs.

Structure and development of sclereids in the petiole of Camellia japonica L., A. S. FOSTER. (Univ. Calif.). (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 302–326, illus. 32*).

Floral anatomy of some species of Cornus, A. M. WILKINSON. (Cornell Univ.). (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 276–301, illus. 38*).—The results of a detailed study of 16 species of the genus are presented.

GENETICS

New light on evolution from research on the genus Crepis, E. B. Babcock. (Univ. Calif.). (*Amer. Nat., 78 (1944), No. 778, pp. 385–409, illus. 5*).—This is a lecture summarizing the author's 25 years' research on this genus containing some 196 species—largely wild plants but including a few weeds and one common garden flower. In this study the evidence on phylogeny was based on as broad a foundation as possible, coming from comparative morphology, physiology, genetics and cytogenetics (chromosomes of 113 species studied), length of life cycle, geographic distribution, and paleontology. The net results led to the conclusion that there are no reasons to doubt and many to believe that the basic cause of all this evolution through adaptation is gene mutation. The processes of differentiation and adaptation have been slow and gradual; minor changes in genes have probably caused most of the differences between individuals which have made these adaptations possible. All through this long slow process the guiding principle eliminating the unadapted and preserving the adapted individuals must have been natural selection.

The evolution of *Crepis* is found to rest on three conditions—(1) plenty of time, (2) plenty of environal changes with passage of time, and (3) isolation of populations through migration; and on three vital processes—(1) creation of isolation through changes in chromosome numbers and associated genetic changes and (2) differentiation of species within the several chromosome number groups via gene mutations, along with (3) differentiation, adaptation through gene mutation, and natural selection. Changes in chromosome number and the attendant changes in their structure have been important in creating isolation between groups of individuals within a species; these structural changes probably account for the arithmetical series of chromosome numbers found in many genera of plants and animals, but they have not been important in creating the morphological and physiological differences between species. This differentiation process in species origin is made possible by the accumulation of gene mutations occurring in already isolated groups or populations. These findings "are diametrically opposed to the hypothesis of speciation by sudden profound changes in species. At the same time they contribute to a still broader and firmer foundation for the neo-Darwinian theory of evolution."

Chromosome number, megasporogenesis, and development of embryo-sac of Clintonia, R. I. Walker. (Univ. Wis.). (*Bul. Torrey Bot. Club, 71 (1944), No 5, pp. 529–535, illus. 37*).

Heterosis, W. G. Whaley. (U. S. D. A.). (*Bot. Rev., 10 (1944), No. 8, pp. 461–498*).—The author of this analytic review (148 references) concludes that any attempt to arrive at a single definitive explanation of the genetic basis of hybrid vigor seems unwarranted with the evidence at hand. The fundamental processes responsible for producing hybrid vigor may differ somewhat in various organisms, but all of them are factors increasing the physiological efficiency. Like other effects, the hybrid vigor level may be supposed to differ in response to environal changes. Solution of the heterosis problem awaits much more evidence as to the general action of genes governing size. "In problems of developmental genetics the background of hybrid vigor offers a more fertile field for study than ever before."

[Botanical papers] (In *Abstracts of Dissertations, 1941. Charlottesville: Va. Univ., 1941, pp. 99–106*).—The following are included: Chromosome Number and Winter Hardiness Relationships in the Higher Plants, by W. M. Bowden (pp. 99–102); and Cytological and Genetic Studies on the Flax Genus, *Linum,* by C. Ray, Jr. (pp. 103–106).

Breeding Neurospora from aborted asci, B. O. Dodge and A. Appel (*Bul. Torrey Bot. Club, 71 (1944), No. 3, pp. 199–206, illus. 2*).—Asci of types of *N. tetrasperma* homozygous for *dd* (*d* = the recessive lethal for ascus abortion) abort and usually deliquesce without ascospore formation; this prevents breeding beyond the first (F_1) asci if both parents in the matings carry this recessive factor. Deliquescent ascus abortion is due to the degeneration of the 8 nuclei without spore delimitation. Certain cultural or other environal conditions may, however, prevent nuclear degeneration, with the further result that a fourth division occurs. The ascus with 16 nuclei is marked by a thickened brown striated ascus wall; such asci somewhat resemble giant ascospores. After heating to 60° C. for 1 hr., many of them germinate. A way is thus provided for breeding generation after generation with the recovery of all the different types of nuclei coming from each mating even though the asci regularly abort. Occasionally in certain races a homozygous ascus succeeds in cutting out one or two abnormal spores; such spores can also be germinated, but there is no certainty of recovering all 4 possible types of nuclei from an ascus.

The ornithine cycle in Neurospora and its genetic control, A. M. Srb and N. H. Horowitz (*Jour. Biol. Chem., 154 (1944), No. 1; pp. 129–139, illus. 4*).—The authors describe seven genetically and biochemically different arginineless strains of *N. crassa*, this character being inherited as a single gene. The mutant strains were of three general classes, viz, those able to grow on arginine, ornithine, or citrulline; those making use of arginine or citrulline but not ornithine; and one mutant with a specific requirement for arginine. This is taken to mean that ornithine and citrulline represent different stages in arginine synthesis, occurring in the order ornithine→ citrulline→ arginine. Double mutant strains, obtained by crossing different arginineless mutants, had growth requirements confirming the order of synthesis and manner of genetic control above postulated. *Neurospora* is shown to have arginase and urease. Interpretation of the experimental results as a whole is that in *N. crassa* there is operating an ornithine cycle which follows the same general course as has been proposed for urea formation in the mammalian liver. Different steps in the cycle are shown to be governed by the influence of particular single genes.

A leucineless mutant strain of Neurospora crassa, D. C. Regnery (*Jour. Biol. Chem., 154 (1944), No. 1, pp. 151–160, illus. 3*).—A leucineless mutant of this fungus induced by ultraviolet irradiation is reported to be differentiated from the normal by a single gene. This strain responded specifically to leucine and its keto acid analog, its conidia failing to germinate and its mycelia to grow in the absence of leucine or α-ketoisocaproic acid. Other amino acids and various other compounds related to leucine failed to stimulate either germination or growth. Leucic acid showed growth-promoting activity when growth had been initiated by adding small amounts of *l*(—)-leucine or its keto acid analog. Isovaleric acid, isovaleraldehyde, isoamyl alcohol, and *d*(+)-leucine in the presence of *l*(—)-leucine increased the weight over that of the *l*(—)-leucine controls but by themselves did not initiate growth. Under standard conditions the dry weight of the mycelium produced by leucineless in liquid culture was about proportional to the leucine available. The weight-leucine relation was stable over rather wide variations in pH, temperature, salt concentration, and presence of various extraneous substances; it was, however, influenced by wide variations in sucrose-leucine ratio. A leucineless mycelium, once growth was started, proved capable of obtaining the leucine required for further growth from certain peptides and proteins.

Collapse of the seed following the mating of Hordeum jubatum × Secale cereale, D. C. Cooper and R. A. Brink. (Wis. Expt. Sta.). (*Genetics, 29 (1944), No. 4, pp. 370–390, illus. 23*).—Failure of hybrid seed to develop to a germinable condition following the mating *H. jubatum* × *S. cereale* (E. S. R., 91, p. 663) is reported to be a result of starvation arising from irregular development and, eventually, complete breakdown of the endosperm. Division of the hybrid primary endosperm nucleus may be somewhat delayed; mitotic division becomes disorderly, giving rise to abnormal numbers of endosperm nuclei varying widely in size and form; and the hybrid endosperm fails to become cellular as in normal *H. jubatum*. The hybrid embryo, retarded in early development, differentiates normally. The embryo shows pronounced evidence of starvation in seeds about to collapse. Antipodals, comprising about 15 cells lying opposite the vascular bundle, form a massive tissue in mature *H. jubatum* embryo sacs. They normally persist during the free-nucleate endosperm stage during which they undergo a striking series of changes in size and character. Advent of *S. cereale* sperm in fertilization evokes slighter initial response in antipodals than follows normal syngamy, and subsequent behavior of antipodals is changed radically. Irregular mitotic behavior of the hybrid endosperm is interpreted as a secondary effect proceeding from associated antipodals.

Inheritance of reaction to physiologic races of Cercospora oryzae in rice, N. E. Jodon, T. C. Ryker, and S. J. P. Chilton. (La. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 497–507*).—Data are summarized for segregations obtained in F_2 and F_3 populations from crosses between resistant, moderately resistant, and susceptible varieties grown during 1940–43 at one Texas and two Louisiana locations. In this work, 35 F_2 crosses gave single and 13 duplicate factor segregations for resistance or moderate resistance v. susceptibility when inoculated with physiologic races of *C. oryzae;* limited F_3 and backcross studies agreed substantially with the F_2 results. As many as three, and probably more, duplicate factors may operate for resistance to a single race. One cross segregated for resistance, moderate resistance, and susceptibility in a 12 : 3 : 1 ratio.

Reaction of F_1 sorghum plants to milo disease in the greenhouse and field, E. G. Heyne, L. E. Melchers, and A. E. Lowe. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 628–630, illus. 2*).—In further studies (E. S. R., 78, p. 64) of the inheritance of resistance to milo disease or *Pythium* root rot (*arrhenomanes*), it was observed that in the cross male-sterile Western Blackhull (resistant) × Darso (susceptible) the reactions of the F_1 hybrid plants varied according to the environment where grown. In the greenhouse under optimum conditions the disease expression in the F_1 was such that the plants were killed eventually but lived much longer than those of the susceptible parent. In the field tests development of the disease was slower and generally less severe so that the F_1 plants appeared normal, though definite symptoms were found by examining the roots and crown. Not only is the male-sterile character useful in commercial production of hybrid sorghum seed, but in addition it is of value when large numbers of F_1 plants are desired, particularly for pathological and genetical studies, such as those here reported.

Cytogenetic studies of hybrids with "Makha" wheat, T. C. Chin and C. S. Chwang (*Bul. Torrey Bot. Club., 71 (1944), No. 4, pp. 356–366, illus. 20*).—Hybrids with *Triticum spelta* and *T. vulgare* indicated that *T. macha* differs both genetically and cytologically from the other hexaploid wheats, having different kinds of awn and disarticulation of the rachis. F_1 plants were very weak and either completely (*T. vulgare* × *T. macha*) or about 60 percent (*T. spelta* × *T. macha*) sterile. At meiosis *T. spelta* × *T. macha* averaged 2.90 chromosomes involved in multivalent configurations and 0.93 in univalents. Bivalents were of reduced chiasma frequency, and bridges were frequent at first anaphase. Hybrids of *T. macha* with the tetraploid species *T. turgidum. T. durum,* and *T. dicoccoides* did not differ greatly from similar hybrids involving *T. vulgare* or *T. spelta.* Multivalent associations occurred, but bivalents were of approximately normal chiasma frequency. Anaphase bridges were found, particularly at the second division. Fertility was high (about 60 percent) except in *T. macha* × *T. dicoccoides,* which was almost completely sterile—apparently through crumbling of the chromosomes at the second division. Awns were of intermediate length in these hybrids, and spikes were longer than in either parent.

Chromosomal variation in guayule and mariola, G. L. STEBBINS, JR. and M. KODANI. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 6, pp. 162–172, illus. 4*). —Somatic chromosome numbers 36, 38, 54, 58, 72, 74, and 108–111 are reported for guayule (*Parthenium argentatum*). Plants with 38 and 74 have a single pair of relatively small chromosomes. Numbers reported for mariola (*P. incanum*) are $2n = 54$, 72, and 90. The entire series found in the two species indicates that they are a polyploid series on the basic number $x = 9$. Plants with 108–111 chromosomes, appearing in progenies of those with $2n = 72$ or 74, and therefore autotriploid with respect to their immediate parents, are dwarf in stature and have abnormally shaped leaves. Meiosis in plants with 54, 72, and 74 chromosomes shows irregularities previously reported for guayule, while that in 36 and 38 chromosome plants from wild seed is more regular. Pollen and seed fertility are correlated fairly well with degree of meiotic irregularity, except that seed fertility is about one-half that expected on the basis of pollen fertility. Both the autotriploids and a haploid derived from 72- and 74-chromosomes parents were highly sterile. Strains of guayule with 54, 72, and 74 chromosomes are believed to be of autopolyploid origin, but probably have undergone secondary modification through rearrangement of chromosome segments and introgressive hybridization with mariola.

The periodicity and duration of oestrus in zebu and grade cattle, J. ANDERSON (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 57–68, illus. 12*).—Study of 1,130 estrous cycles in the zebu and 678 in grade cows indicated that the mean length was 23.03 days in zebus and 22.42 days in grade cows, mainly from Shorthorn and Ayrshire bulls mated to zebus or cows of the native breeds and remated in subsequent generations. The mean duration of estrus averaged 4.78 and 7.40 hr., respectively. Seasonal variations were noted in the cycles and estrus of zebus, but they were less marked in the cows. There was no effect from light or feeding on the sexual activity. Data are recorded on the temperature, rainfall, sunshine, and length of the cycles in 1936-39 in the Rift Valley Province of Kenya.

On the breeding season in the sheep, J. HAMMOND (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 97–105, illus. 6*).—Observations were presented on the breeding season in adult ewes and ewe lambs from 1932 and 1939 in a group of Suffolk × Border Leicester-Cheviot ewes mated with Suffolk and hybrid rams. Ochered rams were run with the flock of ewes. The average duration of 254 estrous cycles was 16.78 days occurring in the period from early October to late March, spaced with considerable regularity about the shortest day (11.5 hr. or less). Two ewes lambed at times indicating service early in August. Five cycles of 20 days or more were observed—26, 20, 27, 35, and 42 days. Ovulation did not generally occur with extremely early heat periods. Suckling influenced the occurrence of heat. A decline in the fertility of services toward the end of the breeding season was noted. Although the number of cases was small, the numbers of lambs born per fertile service rose quickly to a peak in November and slowly declined thereafter. The gestation periods of twin lambs were slightly longer than those of singles, but both ranged from about 140–150 days. Growth during the first 2 mo. was greatest in the lambs born in May. Sexual maturity was reached at about 300 days of age, and if it were not reached during the breeding season ovulation was delayed until the following year. From breeding organs of 342 ewe lambs collected at the slaughterhouse, ovulatory activity seemed to be equally spaced either side of the shortest day. Quite large follicles were noted throughout the anestrous period in those lambs which had not recently ovulated. There was a tendency toward spontaneous ovulation following hormone treatment in anestrus.

A microscopic study of coat variations in White New Zealand and Angora rabbits, T. M. P. HARDY and M. H. MARKLEY (*Jour. Hered., 35 (1944), No. 6, pp. 182–192, illus. 3*).—Microscopic examination and measurements of rabbit hair fibers were made at different levels above the skin in efforts to distinguish short-coated animals that were homozygous from heterozygous rabbits carrying the character for woolly hair. These variations of the domesticated White New Zealand rabbit were compared with the Angora rabbit. The hybrid or carrier type occupied a position intermediate to the short- and long-haired coats in fiber length, number of medullary cells, cross-sectional diameter, and ratio of guard hairs to underfur. The hair of the Angora rabbit was of greater length and lesser diameter than the homozygous and heterozygous short-haired rabbits. The most significant difference between th normal and hybrid short coats occurred in cross-sectional diameters of the guard hairs at the zone above the skin where the fiber attains its maximum diameter. Careful measurements were made of cross sections of each of 500 adjacent underfur fibers of woolly, carrier, and normal New Zealand White rabbits and the fibers of the pure Angora strain. Examinations were made of the underfur and guard hair fibers from pelts of one doe of each of the three types and one buck each from normal and carrier rabbits. There were only slight differences in the diameter of the underfur, but in guard hairs the widest diameter for normal-coated pelts was much greater than in any of the other types. The smaller average fiber diameter as well as greater fiber length of the guard hairs contribute to the silky texture of the woolly recessive as shown by measurements of these guard hairs on five male and five female carriers and equal numbers of normal pelts of each type.

A specific abnormality associated with a variety of genotypes, L. C. DUNN and S. GLUECKSOHN-SCHOENHEIMER (*Natl. Acad. Sci. Proc., 30 (1944), No. 8, pp. 173–176*).—A syndrome was noted in one family of tailless mice in which certain offspring, alive at birth, lacked both anal and genital apertures and died shortly after birth. In such animals there was a simultaneous failure of development of the posterior parts of the gut and the urinary duct, often resulting in the colon and urethra remaining connected, forming a cloaca which has no external opening. In some cases kidneys, ureters, genital ducts, and bladder are missing or abnormal, but they are not constant parts of the basic syndrome and the frequency of these abnormalities varies in different genotypes. In general, the syndrome or parts of it tend to appear when the genes *u, Sd, Ki,* and *Fu* are present in combination with each other or with T, t^0, or t^1 (E. S. R., 89, p. 433). The frequency of abnormal animals appears to be lower in heterozygotes than among homozygotes. By way of explaining the syndrome, when the posterior axial region is sufficiently defective it fails to provide the normal induction stimuli which regulate development of the posterior gut and urinary ducts, particularly the separation of the urogenital sinus from the rectum. Further study may reveal differences in the urogenital effects of different mutants, but the essential features of the syndrome appear to be the usual type of response of the embryo to anatomical defects resulting from independent mutations.

Sensitivity of the reproductive system of hypophysectomized 40-day male rats to gonadotropic substances, M. E. SIMPSON, C. H. LI, and H. M. EVANS. (Univ. Calif.). (*Endocrinology, 35 (1944), No. 2, pp. 96–104, illus. 3*).—The testis weights of rats hypophysectomized at 40 days of age were maintained for 15 days by gonadotropic agents (pregnant mare serum, human chorionic gonadotropin, and pituitary insterstitial cell stimulating hormone). The formation of spermatozoa by 55 days of age occurred with all three hormones at daily doses of about 0.25 rat unit. When under the influence of doses of gonadotropins adequate to influence the size and activity of the testicular tubules, the interstitial tissue regressed. The accessory organs and interstitial tissue required higher doses of gonadotropins for maintenance and growth than the testicular tubules. The data included the weights of the testes, seminal vesicles, prostate, and spermatozoa in the epididymis of groups of at least five hypophysectomized rats after injection with different doses of one or the other gonadotropin.

Ovarian hypertrophy in rats united in parabiosis with littermates previously treated with antigonadotropic sera, H. S. Kupperman, R. K. Meyer, and J. C. Finerty. (Univ. Wis.). (*Anat. Rec., 89 (1944), No. 3, pp. 277–285*).—Ovarian hypertrophy was observed in immature female rats after 10 days' parabiotic union with females which had been treated for 10 days previously with sheep antigonadotropic rabbit serum (E. S. R., 88, p. 39). With the ovarian hypertrophy there was increased pituitary secretion and castrationlike changes of the cellular types in the pituitary. The study was conducted with groups of rats united by parabiosis with antigonadotropic-treated and serum-treated controls, with autopsies at 41 days of age.

Injections of certain plant growth substances in rats and chick embryos, W. S. Dye, Jr., M. D. Overholser, and C. G. Vinson. (Univ. Mo.). (*Growth, 8 (1944), No. 1, pp. 1–11*).—Six plant hormone growth substances had no effect on growth and development of 180 albino rats or 240 chick eggs injected on the tenth day of incubation. Controls were untreated or injected with a phosphate buffer solution.

Effect of some androgenic steroids on the adrenal cortex of hypophysectomized rats, S. L. Leonard. (Cornell Univ.). (*Endocrinology, 35 (1944), No. 2, pp. 83–90*).—The rate of atrophy of the adrenal cortex of male rats following hypophysectomy was decreased by doses of testosterone propionate, androstanediol-3-α-17-trans, and androstenediol-3-β-17-trans started immediately after the operation. The stimulation was directly proportional to the size of the dose. Androstenedione, transdehydroandrosterone, progesterone, and desoxycorticosterone were ineffective. Stimulation of the adrenal cortex was correlated with stimulation of the testes and ventral lobe of the prostate. The stimulation was related to maintenance of cell size and not to an increase in the cell numbers in the cortex. When the treatment was delayed it was less effective.

The effect of pure adrenocorticotropic hormone on the work performance of hypophysectomized rats, D. J. Ingle, C. H. Li, and H. M. Evans. (Univ. Calif. et al.). (*Endocrinology, 35 (1944), No. 2, pp. 91–95, illus. 1*).—The administration of 0.5 mg. of pure adrenocorticotropic hormone to male rats three times per day followed hypophysectomy 14 days earlier accelerated loss in weight and caused a marked adrenal cortical hypertrophy instead of atrophy, thymus atrophy, and a marked increase in the amount of work over the very poor performance of untreated animals. In another experiment there was a complete loss of muscular responsiveness within 18 hr. in untreated animals. Two treated animals showed improved although subnormal performance and required 116 and 144 hr. for complete fatigue. The first of these two experiments was conducted with five treated and six hypophysectomized rats.

The change in the pH of the semen of the bull after incubation, J. Anderson (*Jour. Agr. Sci. [England], 34 (1944), No. 2, pp. 69–72*).—Continuing studies of the pH of bull semen (E. S. R., 88, p. 615), after storage for 1 hr. at 37° C. the pH change of 134 undiluted semen samples of clinically normal bulls was —0.302 ±0.027. With greater pH change there was a lower initial pH and a higher initial motility and number of spermatozoa per cubic centimeter. The greater the decrease in pH the lower was motility after incubation. Semen diluted with egg phosphate as described by Phillips and Lardy (E. S. R., 83, p. 615) maintained better motility than undiluted semen, and the pH changed little. There was no relationship between the pH change and the maintenance of motility after incubation. Determination of the initial pH and the pH change after 1 hour's storage may provide a useful and accurate evaluation of semen for use in artificial insemination.

Rapid method of standardization of the density of bull semen, M. H. KYAW (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 106–109, illus. 2*).—A rapid method of estimating the density of spermatozoa in a semen sample by the use of Brown's opacity tubes was found of sufficient accuracy for use in insemination centers. There was found to be a simple linear relation between opacity and density, with the latter expressed as millions of sperm per cubic centimeter, this being approximately five times the opacity standard.

Results of crossing the Rhode Island Red and White Leghorn breeds of poultry, F. J. DUDLEY (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 76–81*). —An account is given of an experiment involving reciprocal crosses of Rhode Island Reds and White Leghorns at the Northern Breeding Station of the National Poultry Institute at Reaseheath, Cheshire, England. Fertility was about 90 percent, but was slightly superior in crossbreds in the eggs fertilized by males of the same breeds. Crossmating had little effect on the hatchability of fertile eggs, but fertile eggs from Rhode Island Red hens hatched slightly better than eggs from Leghorn hens. The Rhode Island Red pullets were slower in starting to lay, but their weights were heavier at the time of the first egg. The analysis of the results was carried out by the method of weighted squares of the means. The study was conducted in 1934–39 in 2 units each consisting of 6 Rhode Island Red hens and 6 White Leghorn hens with Rhode Island Red males in one and a White Leghorn male in the other. There were 12 units in all. Laying tests were based on 294 purebreds and 315 crossbred pullets from Rhode Island Red dams and 202 purebred and 203 crossbred pullets from White Leghorn dams.

Ontogenetic size differentiation in Single Comb White Leghorns, I. M. LERNER. (Univ. Calif.). (*Growth, 8* (*1944*), *No. 1, pp. 33–41*).—Shank measurements were ascertained for about 60 female chicks from the size line and about 140 from the production line (E. S. R., 90, p. 468) at 4 weeks of age and at each 4-week period thereafter to 28 weeks of age. Half of these were on one ration and half on another. Differences in shank length were slight up to 12 weeks of age, but at more advanced ages significant differences were found, with a maximum at 20 weeks of age. From a statistical analysis of the measurements, it was evident that the shank length was the same in the two lines. Differences were due to the rate of growth rather than to initial size or differences in the duration of growth. Differences in early growth rates due to dietary factors were accounted for by growth divergence from hatching to 4 weeks of age.

Early growth rate of possible value as an indication of future egg production, J. C. HAMMOND and S. K. HAYNES. (U. S. D. A.). (*Poultry Sci., 23* (*1944*), *No. 5, pp. 355–357, illus. 1*).—A striking relationship was found between the average live weights of 442 Rhode Island Red pullets at 6 weeks of age and the egg production of these birds during the first 68 weeks of life. Data are presented on the average weights at biweekly intervals of groups of pullets producing 50–99, 100–149, 150–199, and over 200 eggs. However, there was a sufficient number of high-producing pullets not following this principle to conclude that it is not a practical method of culling.

Early recognition of superior families, I. M. LERNER and L. W. TAYLOR. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 5, pp. 413–417, illus. 2*).—The indexes of production by months and of total production of three series of sire and dam families were correlated. It was found that there was a uniform rise from the value of 0.6–0.8 at the earliest date on November 30, to the end of March when the magnitude of 0.9 was reached. In studies of the determinations of sire and dam families, those of sire families ranged consistently above determinations of dam families. Data for the combined series indicate that determination between sire families is greater than between dam families in the early months of the production year. The efficiency with which cockerels may be selected on the basis of early records of their sisters may vary greatly from year to year. Only two of three superior families could be identified at the time the cockerels were chosen for testing in the succeeding breeding season. The study was based on records of about 9 sire families and, in the respective series, 37, 26, and 52 dam families.

A relation between environment to two weeks of age and mortality from lymphomatosis in adult fowls, F. B. HUTT, R. K. COLE, M. BALL, J. H. BRUCKNER, and R. F. BALL. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 5, pp. 396–404, illus. 3*).—From 160 to 500 days of age, mortality was consistently higher during 7 yr. among pullets from two resistant strains and from a susceptible strain that had been started in one pen than among others that had been started in a second pen. A slight tendency for mortality from lymphomatosis was lower in the last three or four hatches in 1942 than in the first six or seven hatches. It was discovered that chicks brooded in one pen experienced a higher mortality than those in the second pen. This occurred in all three strains in each of the 7 yr. Deaths from neoplasms in 1940, 1941, and 1942 were from 1.6 to 4 times as frequent in the birds from one of the pens as from the other. This difference was found in both susceptible and resistant strains, but the reason for it was not explained. It appeared that environmental conditions in the first 2 weeks of life determined to a large extent mortality in the adult bird resulting from lymphomatosis. A favorable environment during this 2-week critical period appears to be associated with remoteness from adult birds. The number of birds housed annually ranged from a minimum of 1,759 to 2,232 White Leghorn pullets per year.

Observations on certain shell variations of hens' eggs, M. STEGGERDA and W. F. HOLLANDER (*Poultry Sci., 23 (1944), No. 5, pp. 459–461, illus. 1*).—Several variations found in the shells of eggs laid by crossbred Barred Plymouth Rock × Rhode Island Red hens were noted. In one case the pigment was dissolved when the egg was wiped with a damp cloth. In another, there was a chalky white finish which could be wiped or scraped from the shell. A flattening of some rather small eggs was also noted. A more intensive study of these peculiarities, which appeared to be common in a small flock, seemed warranted.

The heart beat of avian embryos, A. L. ROMANOFF. ([N. Y.] Cornell Expt. Sta.). (*Anat. Rec., 89 (1944), No. 3, pp. 313–316, illus. 4*).—Changes in the rate of heartbeat of developing embryos of ring-necked pheasants and bobwhite quail were nearly identical with those in the chick (E. S. R., 62, p. 460) as observed at daily intervals by cultivation in the opened egg (E. S. R., 76, p. 838).

Development of the testis in the ring-necked pheasant, C. M. KIRKPATRICK and F. N. ANDREWS. (Ind. Expt. Sta.). (*Anat. Rec., 89 (1944), No. 3, pp. 317–324, illus. 5*).—Study of the weights of the testes of 80 pheasants, ranging in age from 16 to 362 days, and histology of the testes of 72 of them showed that spermatogenesis was closely correlated with four phases of testicular growth. The first phase, lasting from hatching to 56–81 days of age and characterized by a gradual increase in weight of the testis and the seminiferous tubules, included spermatogonia and a few primary spermatocytes. The second phase (81–144 days) was one of rapid increase in weight of the testis and the production of some spermatozoa. The third stage lasted from 144 to 236 days of age, when the testis and seminiferous tubules contained only spermatogonia and primary spermatocytes. The fourth and most important phase (236–334 days of age) was when full breeding condition was maintained. Testis size and activity of the bobwhite quail also suggest a physiological relationship between stimulation of the testis at about 100 days and the subsequent involution of the thymus and bursa depth.

FIELD CROPS

[Farm crops research in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 9, pp. 2, 6, 8*).—Progress results in research experiments are reported in articles entitled Pontiac, Sebago, Green Mountain Lead Potato Test, by H. H. Foster (pp. 2, 6), and Delta Station Test of Oat, Barley, Rye, Wheat Varieties, by P. W. Gull (p. 8).

Experiments with cotton, corn sorghum, and soybeans at the Rice Experiment Station, Crowley, Louisiana, J. M. JENKINS. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 383* (*1944*), *pp. 19*).—Highest average yields of lint cotton, 1938–42, were from Dixie-Triumph 366, 549 lb.; Station Miller, 531 lb.; and Stoneville-2B, 405 lb. These varieties and Deltapine appear well adapted for the rice area. Yields of 20 of about 100 cotton varieties and strains grown, 1928–42, are reported. Seed cotton yields, 1928–38, averaged highest following the application of 600 lb. per acre of 5–16–4, 5–8–8, and 7–8–4 fertilizer, respectively. Potash 48 lb. per acre, applied in a 5–12–8 mixture before planting, 1931–39, appeared enough to produce maximum cotton yields. Potash as a side dressing was less profitable than when applied before seeding. Average increase in yield of seed cotton, 1933–39, was highest from plats receiving P in bonemeal, and was followed closely by cotton receiving basic slag, citratus, and superphosphate. When fertilizer was applied at rates of 150, 300, 450, and 600 lb. per acre, highest 3-yr. average yields of seed cotton were from the 3–10–3 formula 450 lb. and from the 6–8–6 formula 600 and 450 lb. per acre.

Surecropper, Hastings Prolific, and Cocke Prolific corn in order named made highest average yields, 1932–36, among 20 varieties grown. Low yields are due largely to insect damage and environmental conditions not particularly favorable for corn. When corn was planted March 1 and each 2 weeks thereafter until July 1, 1933–38, highest average yields were from April 15, May 1, and April 1 plantings, respectively.

A rotation of cotton 2 yr. and corn with soybeans 1 yr., 1932–39, failed to increase the yield of seed cotton, and low average production of corn indicated that such a rotation would not be profitable. Cotton and corn, grown in rows spaced 4, 5, and 6 ft. apart, made highest average yields 1934–38, 699 lb. of seed cotton and 10 bu., respectively, from 4-ft. spacing.

Sorgos were superior to grain sorghums in yield of green forage, 1933–39, with Honey sorgo leading. Hegari, Schrock, and Sagrain in order led the grain sorghums. Schrock and Sagrain made the highest average grain yield. While shallu did not yield as much grain as most other varieties, the grain was usually of good quality and was seldom attacked by insects in the field or in storage. Of the sorgos, Sumac outyielded Colman and Honey in order.

Otootan, Biloxi, and Laredo soybeans ranked in order in yield of cured hay 1932–35. Of varieties grown, 1936, 1938–39, Avoyelles led and was followed by Palmetto, Monetta, and U. S. 71570. Barchet was the most consistent in seed production. Because of damage from insects, diseases, and other causes, seed yields were not recorded.

The identification of certain native and naturalized grasses by their vegetative characters, S. E. CLARKE, J. A. CAMPBELL, and W. SHEVKENEK (*Canada Dept. Agr., Tech. Bul. 50 (1944), pp. 129, illus. 143*).—A key for identification of 102 native and naturalized grasses occurring in pastures and meadows in the Prairie Provinces uses characters of vegetative parts such as sheath, collar, auricles, ligule, and leaf-blade for their separation. Diagrammatic drawings, emphasizing structural characteristics, and descriptions of these parts are presented for each species. Information is given on growth characteristics, underground portions of the plant, and habitat conditions. Indexes to botanical and common names are included. Nomenclature is in accordance with that used by Hitchcock (E. S. R., 73, p. 465).

Preliminary trials on the effect of management on the establishment of perennial grasses and legumes at Davis, California R. M. LOVE. (Univ. Calif.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 699–703*).—Early intensive grazing before annuals headed reduced competition provided by them and resulted in the best stand of vigorous perennials. Removal of sheep before all available moisture was exhausted enabled perennials to continue development to maturity. A short period of fall grazing did not damage young perennial plants. Late grazing, beginning when annuals were maturing, reduced stands of perennial grasses by about 80 percent and perennial legumes by about 50 percent. Prolonged grazing into the dry season probably hindered further development of seeded species, which were reduced in numbers and in vigor. Late mowing, followed by prolonged grazing, resulted in the poorest stands of perennials.

West Virginia grasses, E. L. CORE, E. E. BERKLEY, and H. A. DAVIS (*West Virginia Sta. Bul. 313 (1944), pp. 96, illus. 40*).—The 187 species and varieties of grasses known to occur wild in West Virginia are described and illustrated with determinative keys, distribution records, and ecologic notes. Information on their importance as forage, hay, and soil-binding plants or as weeds is included, and a glossary and an index are appended.

[Meadow and pasture research in Louisiana] (*Dairy Res. Digest [Louisiana Sta.], 2 (1944), No. 3, pp. 1, 2*).—Progress results from current investigations are reported in brief articles entitled Leesville Clover Plots Give High Yields, and Clover Yields High Near De Ridder, both by D. M. Seath and L. L. Rusoff.

Studies on the use of the point-quadrat method of botanical analysis of mixed pasture vegetation, W. B. DREW. (Mo. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 7, pp. 289–297*).—Assuming that weight-list data provide a reliable basis of comparison, the point-quadrat method yielded more satisfactory results than the count-list method in botanical analysis of a lespedeza-grass pasture at Columbia, Mo. No tendencies toward underhitting of the legume or overhitting of the grass were noted in the results. Tests of the relative efficiency of four different applications of the point-quadrat method on the same type of vegetation indicated that counting of all hits as the needles of the apparatus are pushed through the plants to the ground yielded more reliable results than recording the first plant hit by each of the 10 needles. Height of vegetation and morphology of species involved were found to affect the results, as well as the manner of use.

The place of pastures in Utah agriculture, A. F. BRACKEN (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 3, pp. 8, 13, 15*).—The characteristics and location of the main pasture types in Utah are described, and management and improvement practices are discussed.

A year-around grazing program for the alkaline soils of the Black Belt of Alabama, K. G. BAKER and E. L. MAYTON. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 9, pp. 740–748, illus. 4*).—Experiments, 1933–42, at the Black Belt Substation indicated black medic, white clover, and Dallis grass as the best plants for permanent pasture. From 200 to 400 lb. of superphosphate and

50 to 100 lb. of potassium chloride per acre annually, or heavier applications at 3-yr. intervals, should be applied on both permanent and temporary pastures. At current prices, commercial N has not been profitable on permanent pastures. Manure alone on permanent pastures has produced small gains in yield of beef, which was increased very materially by superphosphate. A direct relation was evident between amount of protein produced per acre and beef yield per acre. During the grazing season on permanent pastures, seasonal peaks of gain and carrying capacity occurred with corresponding periods of low gains and low-carrying capacity. Supplementary grazing crops to fill out the periods of low grazing have been essential for maximum returns from fertilization. Black medic and Johnson grass grown in rotation have been the best plants for supplementary pastures, although in more intensive operations, as dairy farming, small grains may be used in rotation with Johnson grass.

Winter survival of rough- and smooth-awned barleys, G. K. MIDDLETON and R. W. MCMILLEN. (N. C. Expt. Sta.). *(Jour. Amer. Soc. Agron., 36 (1944), No. 7, pp. 626–627).*—Further studies (E. S. R., 86, p. 182) involving 6 crosses among rough- and smooth-awned and hooded barleys showed rough-awned segregates to usually surpass smooth-awned in percentage of winter survival. A fairly close relationship seemed to exist between rough-awnedness and winter habit and between smooth-awnedness and spring growth habit. The linkage is not so close but that winter type smooth-awned strains can be obtained, yet it makes their isolation from hybrid populations rather difficult.

Winter barley in West Virginia, R. O. WEIBEL *(West Virginia Sta. Bul. 314 (1944), pp. 27, illus. 2).*—Information on growing winter barley considers soil and fertility needs; varieties and cultural and harvest practices, based extensively on test results in different sections of West Virginia, 1933–43; diseases and their control; and uses of the crop for feed grain, pasture and soiling, and as a nurse crop.

Barley evidently should be sown at least 2 weeks before normal seeding time for wheat; not later than September 15 for lower altitudes of the northern third of the State, as at Morgantown and Kearneysville; and on September 20-25 for the southern part, as at Lakin. Scottish Pearl, Kentucky 1 and 2, and especially in the eastern part of the State, Tennessee Winter 52, all rough-awned, and where desired, Tennessee 6 and Missouri Early Beardless of the hooded types, are recommended. Comparison of average yields, 1930–39, showed that barley has produced more pounds of grain and total digestible nutrients per acre than oats or wheat, and surpassed these crops and corn in production of pounds of digestible protein per acre.

Results of the cooperative regional castor bean tests, 1941, [1942, 1943] (Coop. State expt. stas. et al.). *(U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., [1942], pp. 60+; [1943], pp. 28+; [1944], pp. 19+).*—The program organized late in April 1941 after probable need for domestic production of castor-beans for war industries became apparent, included 63 variety tests, 19 spacing tests, and 6 fertilizer tests in 17 Central, South Central, and Southwestern States and Maryland. Each of 47 strains was grown at from 1 to 53 locations, providing data on yields, hulling percentage, and numbers of spikes per plant. Number of plants per acre appeared to be more important than spacing within and between rows in determining yield. In limited trials, slight yield response was obtained from N, P, K, and lime. Little variation was noted between varieties or locations in oil content of seed, whereas beans not fully mature due to disease, insect or frost injury, or other causes usually were low in oil. Gray mold (*Sclerotinia ricini*), which attacks young capsules, caused serious damage in Florida and Georgia. The Conner variety was moderately susceptible to cotton root rot (*Phymotomtrichum omnivorum*). In certain areas, seed did not mature normally following puncture of young capsules by green stinkbugs.

In 1942, 69 tests of 3 types were conducted in 23 States. Data on 6 agronomic characters of Conner, Doughty 11, Kentucky 38, U.S. 4, U.S. 7, and Kansas Common planted in 61 uniform tests, furnished information on regional adaptation and a basis for limiting number of varieties in immediate production programs. When Conner was planted biweekly from April to June in uniform tests in Kansas, Missouri, Illinois, and Oklahoma, yield decreased markedly from earliest to later plantings in all except Oklahoma tests. The 12-, 24-, and 36-in. spacings (single plant) produced similar yields in 4 uniform tests in the same regions, but 48- and 60-in. spacings were too wide for maximum yields of Conner. Gray mold and green stinkbugs again reduced yields in some localities.

The 1943 program comprised 50 tests at 35 locations in 15 States. No yield differences were found in 6 of 12 uniform tests among 12-, 24-, and 36-in. spacings between single plants in drilled rows or equivalents in checked rows. In the other 6 tests, yield differences usually favored the closer spacings. In 6 date-of-planting tests in 5 States, usually with 3 varieties, yields were highest from earliest plantings. When N, P, and K were applied alone and in combinations in 2 tests with Conner in Kentucky, the only significant yield increase resulted from P alone on land where corn usually responds appreciably to similar applications of NPK. In 3 tests with 3 varieties to indicate harvest frequencies to prevent serious loss by shattering, yields from harvest as often as needed to get all beans or only when serious loss seemed imminent were not significantly different, whereas those harvested only once after the first killing frost were considerably lower. Clipping growing points out of young plants increased branching but reduced yield by delaying heading and maturity. Conner, Doughty 11, and Kentucky 38, markedly different in habit of growth and earliness, generally responded alike to treatments in the various cultural tests. Conner yielded about the same on listed and surface-planted land, but weed control was much easier on listed areas. *Alternaria ricini*, a fungus attacking inflorescences, was observed in all material examined critically; its effect on seed filling is presumed to be detrimental. Gray mold was observed again in the Gulf coastal region.

Effect of moisture, seeding dates, and fertilizer on stands and yields of crimson clover, R. E. STITT. (U. S. D. A. coop. N. C. Expt. Sta. et al.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 464–467, illus. 2*).—Crimson clover (*Trifolium incarnatum*) seed with hulls on required more moisture for germination than hulled seed in tests at Statesville, 1935–42, but the hulls have helped overcome hazards of light rainfall after seeding on dry surface soils. Effectiveness of a given seeding date was dependent upon time of season and precipitation. Seedings made later than October 1, were seldom successful due to winter injury and reduced growth in the spring. Superphosphate increased yields but did not affect emergence of clover seedlings.

Carbohydrates as an index in determining winter hardiness of red clovers outside the polar circle, S. A. KASPAROVA and T. A. PROSKURNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 8, pp. 355–359*).

The value of fertilizer for corn, R. COLEMAN (*Mississippi Sta. Cir. 120 (1944), pp. 11, illus. 4*).—Corn experiments in different localities in Mississippi showed that N is the most profitable fertilizer, and on soils known to be deficient in P and K, these nutrients should be added with N. For best returns, at least 32 lb. per acre should be applied by placing one-half under the crop and one-half as a side dressing. Profits per dollar invested when 24 lb. of N were applied were from ammonium nitrate $6.15, ammonium sulfate $4.94, sodium nitrate $4.83, Uramon $4.14. and calcium cyanamide $1.50. The results suggest that if all of Mississippi's corn land were properly fertilized with N, the average State yield could be increased from 15 bu. to 25 or 30 bu. per acre.

Sampling ear corn for moisture determination, E. E. Down, J. W. Thayer, Jr., and E. Vander Meulen. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 5, pp. 461–463, illus. 1*).—In both September 16 and November 3 harvests, moisture content, as determined from 1-in. cross sections of ears taken with the device illustrated, more closely approximated moisture content on the basis of whole ears than did that determined from gouged kernels. Middle sections contained slightly less moisture than sections cut from tips and butts, but sections may be taken at random in field operations.

Studies with recently developed cotton strains in the Yazoo-Mississippi Delta, 1943, J. W. Neely and S. G. Brain (*Mississippi Sta. Cir. 121 (1944), pp. 8*).—Yields of seed cotton and lint per acre, ginning percentage, bolls per pound of seed cotton, classers' staple length, and fiber measurements, including bundle strength, length uniformity, and length at the upper half mean are tabulated and discussed for 49 strains in the new strains study, 49 in miscellaneous advanced strains, and 25 Delfos advanced strains, all grown at the Delta Substation in 1943.

The effect of potash level on several characters in four strains of upland cotton which differ in foliage growth, J. H. Turner, Jr. (Ga. Coastal Plain Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 668–698, illus. 1*).—When four strains of upland cotton, differing in foliage characteristics, were studied in 1941–44, significant increases in acre yield of seed cotton were shown between 20–, 40–, and 80–lb. levels of potash (K_2O) on Tifton sandy loam. Differences found between the light-foliaged strain and the three strains of heavier foliage were highly significant. The heaviest foliaged strain seemed to give the largest response to higher potash levels, while the lightest foliaged cotton showed a greater bloom production than the heavy-foliaged types. No definite effect of bloom production was identified with potash levels. Increases in boll size accompanied increase in potash, and differences were also found between all strains, with average boll size larger as foliage became denser. Leaf loss was lower for the higher potash levels. Light-foliaged types lost the most leaves, and differences were present between each strain, with leaf loss diminishing as foliage was denser. High bloom production was not indicative of high yields, different foliaged types showed differences in setting efficiency, and high potash levels were of benefit in setting more fruit. Strain × treatment interactions were significant for all measures of production efficiency.

Potato production in the Northeastern and North Central States, P. M. Lombard and B. E. Brown (*U. S. Dept. Agr., Farmers' Bul. 1958 (1944), pp. 42+, illus. 18*).—Factors concerned with potato production discussed include the soil and its preparation; planting operations and subsequent cultural care of the crop; use of fertilizer, lime, and manure; varieties; care and treatment of seed tubers; spraying; harvesting; and storing. Certain features relative to potato production in each of the different Northeastern and North Central States are described, with remarks on varieties grown. This publication supersedes Farmers' Bulletin 1064 (E. S. R., 41, p. 829).

Rotation, cultural, and irrigation practices affecting rice production, M. Nelson (*Arkansas Sta. Bul. 445 (1944), pp. 45*).—Influences of different rotation, cultural, and irrigation practices on yields of Supreme Blue Rose rice were determined in field experiments at the Rice Branch Station in continuation of previous work (E. S. R., 65, p. 732).

Rice rotated with Mammoth Brown soybeans cultivated or broadcast early or with fallow produced larger yields than continuous rice. All 2-yr. rotations of rice with soybeans harvested as hay or beans, or turned for soil improvement, produced larger rice yields than continuous rice and were considered more desirable than rotations of rice with fallow. Soybeans followed by vetch turned under, followed by rice 2 yr., was the outstanding 3-yr. rotation. Fertilizer for soybeans in another 3-yr. rotation did not maintain yields at as high level as vetch green-manure for rice following. Relatively large average yield increases were made by the first crop of rice in two 4-yr. rotations including soybeans, oats, and rice. Increases in yields of rice were about as half as large in the second year as the first. Best results in 2-, 3-, and 4-yr. rotations were obtained when rice was planted on the same soil on an average of not more than half of the years. Use of legumes for increasing yields of rice equaled or surpassed the application of 500 lb. of 4–8–8 fertilizer to crops preceding rice (E. S. R., 89, p. 441). Soybeans, lespedeza, and vetch plowed under before rice resulted in increased rice yields. Harvesting soybeans for seed and plowing under the straw, or harvesting lespedeza hay and turning under the second growth, resulted in as large rice yields as after clean fallow the previous year.

Broadcasting rice on the soil surface and irrigating at once gave higher yields than the usual practice. Larger average increases in yields were obtained when the soil was flooded and seed broadcasted on the water. Consistent relationships did not exist between grass and weed infestation and yields of rice, methods of cropping, tillage practices, or irrigation methods. Even rice on land fallowed the preceding year did not differ significantly from the check in degree of such infestation. Relatively deep plowing, 9 in., preparatory to planting, resulted in larger yields than either 6- or 3-in. depths. Delay of 2 weeks beyond the usual time for planting resulted in decreased yields of rice.

Results of experiments with rice in Louisiana, J. M. JENKINS and J. W. JONES. (Coop. U. S. D. A.). (*Louisiana Sta. Bul. 384* (*1944*), *pp. 39*).—Variety, seeding, irrigation, rotations, and fertilizer experiments with rice and a permanent pasture study conducted on Crowley silt loam at the Rice Station supplemented and continued earlier work (E. S. R., 54, p. 35).

Zenith and Early Prolific in the early group; Blue Rose, Fortuna, Nira, and Acadia, midseason; and Rexoro in the late group were found to be well adapted varieties. Fortuna, Rexoro, Blue Rose, and Caloro made highest average yields from seeding (E. S. R., 76, p. 473) about April 1, and Early Prolific and Nira when seeded May 1 and May 15, respectively. Days required from seeding to maturity, for each variety, decreased as the seeding date was delayed. For a difference of 76 days in time of seeding (March 17 and June 1), there was a spread in dates of maturity of about 50 days for Rexoro, Nira, Fortuna, and Early Prolific, but only about 20 days for Blue Rose and Caloro.

In a submergence experiment, each variety made highest (average) yields on land submerged 20 days after seedlings had emerged. Early continuous submergence, 10 days after seedlings emerged, gave higher yields, 1934–39, than intermittent drying of land followed by continuous submergence. Holding water on rice stubble or uncropped land during fall, winter, and summer, or after late fall plowing until March 1 did not affect rice yields.

In 2-yr. rotations, rice yields averaged highest after Italian ryegrass and following clovers on stubble pasture, slightly lower after cultivated fallow or soybeans plus fall-sown bur-clover, and lowest after cotton dusted with calcium arsenate. In another test, rice after cotton dusted with calcium arsenate averaged 31.9 bu., and after cotton not dusted 45.1 bu. Yields of cotton and soybeans in a 3-yr. rotation of cotton, soybeans, and rice, as in the 2-yr. rotations, averaged too low to be profitable, and rice yielded somewhat less than in the better 2-yr. rotation. In 4-yr. rotations, fertilizing cotton (2 yr.) or stubble pasture (2 yr.), did not increase rice (2 yr.) yields, but rice after stubble pasture yielded 7.4 bu. more per acre than after cotton, which was in accord with results of other rotation experiments. Rice yields in 10-yr. rotations of rice 5 yr. following 5 yr. in (dusted) cotton averaged 32.1 bu. per acre, after native pasture 47.1, corn plus soybeans 45.6, and improved pasture 48.7 bu. On land continuously in rice 49 yr., 5-yr. average yields in the last 30 yr. ranged from 24.5 to 32 bu. per acre, the fluctuations appearing due to climatic variations rather than to depletion of fertility.

Average yields of rice were increased materially by application of complete fertilizer at seeding time and 8 weeks after the land was submerged. Largest increases in yields from fertilizers were obtained on relatively fertile soil, as improved pasture and land on which straw had been turned under. On less fertile land increases were smaller, indicating that organic matter must be maintained in the soil to obtain maximum benefits from fertilizers. The source of P in a complete fertilizer was of less importance than the formula used. Largest and most consistent increases in yield were obtained with the 8–10–6 formula. With this fertilizer, applied at seeding time 400 lb. per acre, the largest increases in yield were obtained, but with applications at seeding time and 8 weeks after irrigation at rates of 100, 200, and 300 lb. per acre yields also increased materially.

In southwestern Louisiana, the general practice is to grow a rice crop and then pasture the land with cattle for 1 or 2 yr. In permanent pasture studies (E. S. R., 76, p. 469), highest yields of cured hay were taken from seeded improved pastures, limed and fertilized.

Natural and controlled pollination in sesame, D. G. LANGHAM (*Jour. Hered., 35 (1944), No. 8, pp. 254–256, illus. 1*).—The 4.6 percent of cross-pollination, found in sesame (*Sesamum indicum*) under field conditions at Caracas, Venezuela, was attributed to visits of insects, mostly honeybees. A simple method for making controlled pollination is described and illustrated.

[Soybeans and their products] (*Soybean Digest, 4 (1944), Nos. 11, pp. 22–24, 25–30, 32–65, illus. 1; 12, pp. 9–10, 15*).—Papers of interest to agronomists and other technologists presented at the twenty-fifth anniversary meeting of the American Soybean Association at Urbana, Ill., September 12–13, 1944, included: What Is the U. S. Regional Soybean Laboratory Doing? by J. L. Cartter (pp. 22, 62) (U. S. D. A. coop. 24 expt. stas.); Twenty-Five Years of Soybean Growing in America, by W. E. Riegel (pp. 23–24); Contributions of Machinery and Power to Soybean Production, by E. W. Lehmann and H. W. Bateman (pp. 25–27) (Ill. Sta.); The Soybean Oil Rainbow, by H. W. Galley (pp. 27–29); Where to in Cornbelt Soybean Production, by G. G. McIlroy (pp. 29–30); The Germination of Stored Soybeans, by R. F. Fuelleman and W. L. Burlison (p. 30) (Ill. Sta., U. S. D. A., et al.); Insects Attacking Soybeans Stored in Illinois, by M. D. Farrar (pp. 32, 65); An Analysis of the Soya Food Situation, by D. S. Payne (pp. 33–34), and The Breeding Work of the U. S. Regional Soybean Laboratory, by L. F. Williams (pp. 34, 64), (both U. S. D. A.); Soybean Storage Studies, by D. G. Carter and L. E. Holman (pp. 35, 64) (Ill. Sta., U. S. D. A., et al.); Utilization of Soybean Oil Meal as Feed and Fertilizer, by J. W. Hayward (pp. 36, 38); Soybean Research—A Look Into the Future, by O. E. May (pp. 39–40) (U. S. D. A.); Inoculation and Nitrogen Nutrition of Soybeans, by A. G. Norman (pp. 41–42) (Iowa); Some Problems in Using Soybeans as Food, by J. I. Simpson (pp. 43–44) (Ill.); Utilization of Soya Proteins in Industry, by P. E. Sprague (pp. 47–48, 51); Facts on Soybean Fertilization, by A. L. Lang (pp. 52, 54, 58); Creating New Kinds of Soybeans, by C. M. Woodworth (pp. 56–58), (both Ill.); Soybean Disease Investigations at the U. S. Regional Soybean Laboratory, by W. B. Allington (pp. 60, 65) (U. S. D. A.); and Nutritive Value of Soybeans, by G. M. Kinsman (pp. 9–10, 15) (Ill.).

Crop relationships with special reference to nitrogen efficiency, R. J. BORDEN (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *48 (1944), No. 2, pp. 65–72*).—Experimental results, 1937–42, provided information on relationships useful in planning field practices, especially in judging efficiency obtained from N application to sugarcane. Plant crops produced higher yields than ratoons and used applied N fertilizers more efficiently. Crops started in October to December produced poorer yields and were less efficient in N use. N at 150 to 175 lb. per acre sufficed for plant crops and was efficiently used at this rate, but for ratoons slightly larger quantities were indicated. Harvesting from January to June was indicated as most desirable, whereas July to September harvests gave low yields. Improvement in juice quality and higher yields of cane and sugar followed increases in age of cane at harvest. An almost linear relation was found between cane and sugar yields. A higher N requirement per acre, but less per ton of cane and sugar, was associated with increases in yields, but N per month values were quite constant, regardless of changes in yields. Nitrogen efficiency values from those crops which had the best performance records (tons of sugar per acre per month) were for plant cane in pounds of N, 173 per acre, 8.3 per month, 1.7 per ton of cane, and 14.6 per ton of sugar; and ratoons 175, 9.6, 2.1, and 17.4 lb. of N, respectively. The highest N efficiency values are indicated as about 8 lb. per month, and at about 2 lb. per ton of cane.

Vegetative differences influence the composition of sugar cane, A. H. CORNELISON (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *48* (*1944*), *No. 2, pp. 125–164, illus. 36*).—Small differences were found to exist between the H 109, POJ 2878, and 31–1389 varieties in concentrations of sugars, moisture, and other plant constituents, but the largest differences between varieties were in vegetative type and time responses. Large differences in rates of growth, age-types of cane in the field, longevity of stalks, number of stalks, flowering habits, and variable responses to weather were indicated. Vegetative differences were found to influence the time of appearance and magnitude of the variations in concentration of plant constituents at any time. Wide variations experienced under identical growth conditions indicated that each variety must be studied for optimum fertilization, irrigation and other treatments, and optimum harvest periods. The period of physiological maturity, rather than chronological age, will determine crop behavior in different varieties and is deemed of utmost importance in determining the adaptability of a variety to Hawaiian climate and cropping systems. Varieties having short physiological life cycles and thereby poor "carry-over" qualities cannot be adapted to the harvesting schedules. See earlier notes (E. S. R., 86, p. 38).

Sweetpotato production: Fertilization and hill spacing studies, W. S. ANDERSON and J. S. RANDOLPH. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 402* (*1944*), *pp. 22, illus. 8*).—Experiments with two rates of application of 6–8–8 fertilizer to Triumph sweetpotatoes in combination with 10-, 20-, 30-, and 40-in. hill spacings of plants and with different fertilizer replacements were made in 1939–42 in the Laurel area. Effects of treatments on total yields and on yields of the larger and smaller size roots are shown, and profits to growers are estimated in returns per man-hour and per acre for each treatment.

At all spacings planted early or late, the 1,000-lb. rate outyielded 500-lb., but the difference was less in early planting at close spacings than at wide spacings. The two rates differed little at wide spacings planted late, but 1,000-lb. considerably outyielded 500-lb. at close spacings planted late. The 500-lb. rate with 20-in. hill spacings gave the highest net return. The 10-in. and 20-in. hill spacings were less profitable with 1,000-lb. than 500-lb. of fertilizer, and 30-in. and 40-in. spacings gave about the same return with either rate. In late planted tests, higher yields were made by close spaced plats on both fertilizer rates. No profit per acre was shown from late planting, yet net labor income up to about 15 ct. an hour was shown for these plantings. Close spacing did not offset harmful effects of late planting. In income per man-hour, the 500-lb. rate with 20- to 40-in. spacings exceeded other treatments except 1,000-lb. with 40-in. spacing.

Placement of fertilizer affected yield, and application of 500 lb. of 6-8-6 in bands 3 in. to the side of and on a level with the plant roots at transplanting time surpassed all other placements in total yield and net return. Starter solutions, supplementary to a complete fertilizer, were of slight value. Placement of 800 lb. of 6-8-8 fertilizer with tractor cultivator attachments at or just before transplanting in bands 3 in. to the side of and on a level with the plant roots gave higher yields than placement in row centers or on each side in bands nearer to or farther from plant roots. Such variations in rate and placement of fertilizer and in hill spacing had little effect upon the starch content of the sweetpotatoes. See an earlier note (E. S. R., 89, p. 442).

Studies of delayed digging of sweet potatoes of the Porto Rico variety, W. D. Kimbrough. (Coop. U. S. D. A.). (*Louisiana Sta. Cir. 34 (1944), pp. [4]*). This material has been noted from another source (E. S. R., 91, p. 682).

Varieties of winter wheat for Nebraska, K. S. Quisenberry, O. J. Webster, and T. A. Kiesselbach. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 367 (1944), pp. 20, illus. 8*).—Winter wheat varieties recommended for certain areas in the State from continued experiments (E. S. R., 83, p. 622) are Pawnee, Nebred, and Cheyenne. Acceptable wheats not on the recommended list are Nebraska No. 60, Turkey, Tenmarq, Blackhull, Comanche, and Iobred. A few of the varieties grown in surrounding States but not indicated for Nebraska are Iowin, Kanred, Kawvale, Chiefkan, Red Chief, and Wichita. Yields, other agronomic characters, adaptation, winter hardiness, disease resistance, and milling and baking qualities are described for each variety, and acceptable cultural practices developed in experiments reported earlier are outlined.

New smut resistant wheat released by station (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 3, p. 5*).—Wasatch, a new hard red winter wheat of the Turkey Red type, developed by D. C. Tingey of the station and R. W. Woodward of the U. S. Department of Agriculture from a cross between Ridit and Relief wheats, and released to farmers, is considered a distinct improvement over varieties released earlier by the station. It has a stiffer straw than Relief and is said to be the most highly resistant of any commercially grown wheat to cereal smuts and especially dwarf smut.

Seed treatment with plant hormones in crop production, R. P. Bartholomew (*Arkansas Sta. Bul. 444 (1944), pp. 13*).—Treatment of seeds of soybeans for hay and grain, sorgo for silage, rice, corn, and cotton with three plant hormone dusts and various fungicidal dusts resulted in practically no significant increases in yield under a wide range of soil conditions. Large significant differences between yields of corn of the same treatment planted on different dates were associated with date of planting and not with seed treatment. It is concluded that seed treatment with the plant hormones used in this experiment cannot be recommended as a general practice in Arkansas.

HORTICULTURE

The aerosol method of treating plants with growth substances, P. W. Zimmerman and A. E. Hitchcock (*Contrib. Boyce Thompson Inst., 13 (1944), No. 7, pp. 313-322, illus. 4*).—The aerosol method of treating plants with growth substances was successfully used for inducing epinasty, parthenocarpy, and fruit set in the tomato. The hot plate method and cylinders with liquefied Freon gas for dispensing aerosol were both effective. When the aerosol method was used in a greenhouse, the entire plant responded to the treatment. By using a special type cylinder with a spring attachment for releasing the gas, local parts of a plant could be treated without affecting the whole plant. Of a total of 31 chemicals tested, 15 were active in modifying leaf growth and therefore undesirable for the aerosol method of inducing parthenocarpic development of fruits.

Carbon dioxide storage.—XII, Germination of seeds in the presence of carbon dioxide, N. C. THORNTON (*Contrib. Boyce Thompson Inst., 13 (1944), No. 7, pp. 355–360*).—In continuation of this series (E. S. R., 81, p. 348), tests conducted at seven temperatures, ranging from 5° to 35° C., showed that from 40 to more than 80 percent of CO_2 is necessary when a normal supply of O_2 is present to inhibit germination of seeds of cabbage, pepper, pea, radish, sunflower, tomato, and wheat. Cabbage, pea, sunflower, and wheat initiated germination in all concentrations of CO_2 at all germinating temperatures except 5° and 10°, and at these temperatures high concentrations of CO_2 retarded germination of all but cabbage. The germination of buckwheat, delphinium, and onion seeds was inhibited by 20 percent CO_2, but only at 10°. The inhibiting effect of CO_2 was greatest at low temperatures, lowest at intermediate, and again operative at the highest temperatures used. Under the usual growing conditions, one need not consider the effect of CO_2 produced in the soil on seed germination.

Parthenocarpic fruit production in horticultural plants, R. J. HILTON (*Sci. Agr., 24 (1944), No. 10, pp. 451–455*).—Parthenocarpic fruits were easily induced on the petunia and tomato by applications of plant hormones and chemicals such as indolebutyric and naphthaleneacetic acids. Such treatments were not effective on the potato and the apple. Naphthaleneacetic acid and indolebutyric acid were found effective over a wide range of concentrations on tomato and petunia flowers. For naphthaleneacetic acid the effective range in lanolin paste was 0.01 to 5.0 percent and in spray solutions 0.005 to 0.25. The author concludes that attempts to induce a set of apples in a season when conditions were unsatisfactory for natural pollination would be completely ineffective.

Vegetable crops in relation to soil fertility.—I, Yields of lettuce and spinach as influenced by variable calcium and nitrogen, R. A. SCHROEDER and S. H. WITTWER. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 469–472*).—Spinach and lettuce plants were grown in Putnam silt loam at calcium levels of 0, 5, 10, 20, and 40, and nitrogen levels of 5, 10, 20, and 40 milliequivalents per plant. The plants were grown in a greenhouse under normal light and temperature conditions of late fall and winter. Both crops responded to an increase in nitrogen at all calcium levels, but the results indicated that spinach yields are more a function of nitrogen supply and that yield increments for lettuce are more dependent on calcium additions.

Increased production of vegetable seed in Utah, L. H. POLLARD (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 3, pp. 3, 17, illus. 2*).—A notable expansion in the production of vegetable seeds has taken place in Utah recently. The station is cooperating with the U. S. Department of Agriculture in studies with onions, carrots, beets, and turnips, with indications of developing a profitable industry for Utah farmers.

The effect of time of application of nitrogen fertilizers on the yield of asparagus, W. J. CLORE. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 501–505*).—Asparagus fertilized with ammonium sulfate outyielded consistently comparable areas receiving either alfalfa hay or horse manure containing equivalent amounts of actual nitrogen. However, there was an indication of a leveling off of production on plots receiving commercial nitrogen, whole plots receiving organic material were increasing. Total yields were little affected by time of applying nitrogen, but there was a significant increase in size of spears where relatively large amounts of nitrogen were applied before the cutting season.

The effect of temperature on the growth rate of field grown beets, B. S. PICKETT. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 457–461, illus. 2*).—Observations upon Early Wonder and Crosby Egyptian beets, sown in a series of plantings in the fall of 1941 and in the spring and fall of 1942 showed growth to occur between average daily temperatures of 40° and 80° F. or a little higher. The best temperature for increase in fresh weight of the Crosby Egyptian beet was about 68.6° and for Early Wonder 73.4°. Beet varieties vary apparently in their temperature requirements, and knowledge of these variations should help in determining the optimum planting seasons.

Effect of side dressings of different sodium and nitrogenous salts on yield of beets, C. B. SAYRE and J. I. SHAFER, JR., (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 453–456*).—A very marked improvement in growth and foliage color was obtained in a field of beets growing on Ontario loam soil near Stanley, N. Y., where 500 lb. or more of common salt was applied on August 19 as a side dressing with nitrogen. Nitrate of soda was the only form of nitrogen that gave a significant increase without the supplemental salt. Although 1,000 lb. of common salt with nitrogen caused a quicker recovery than 500 lb. with nitrogen, the 1,000-lb treatment did not give larger yields and hence the 500 lb. is recommended as the safer treatment. There was evidently a definite nutritional response to sodium. That sodium was not functioning as a partial substitute for potassium was shown by the failure of additional potassium to increase yields as much as did the common salt addition.

The influence of temperature and duration of storage of roots on reproduction of table beet, E. H. and V. K. TOOLE, E. P. EMACK, and W. E. PARRISH. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 445–447*).—A fall crop of table beets grown in a cool greenhouse at Beltsville, Md., was harvested in November and after topping stored at 33°, 40°, 45°, and 50° F. After 8, 12, 16, and 20 weeks of storage, roots from the various temperatures were planted in a greenhouse. The time from planting to flowering was influenced by the temperature in roots stored 8 and 12 weeks, but not in those stored longer. When stored for 8 to 12 weeks, roots developed visible flower stalks sooner and in greater percentage at 45° and 50° than at 33° and 40°.

Thirty varieties of cabbage tested at Crystal Springs to determine worth, E. L. MOORE and J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 9, p. 2*).—Dark Green Copenhagen was the most productive early variety in the trials and withstood low temperatures as well as did Golden Acre. Resistant Detroit was also a high yielding variety. It was as early as Golden Acre, which variety it resembled in type. Ferry Round Dutch and Early Round Dutch were more cold tolerant and resistant to premature flowering than any of the varieties tested. Other varieties tested included four new introductions from the U. S. D. A. Regional Vegetable Laboratory at Charleston, S. C. These were Volnot, Madison, Huguenot, and Wauchula.

Propagating cabbage by leaf cuttings, C. L. ISBELL. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 491–493, illus. 11*).—A brief account is presented of the successful propagation of Charleston Wakefield and Iowa Cope cabbage by leaf cuttings, consisting of entire single leaves. The method might be useful to plant breeders in increasing and preserving valuable stocks.

Crown division of roots as an adjunct to carrot breeding and seed production studies, G. W. WOODBURY and H. K. SCHULTZ. (Idaho Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 488–490, illus. 3*).—Stored carrot roots of several varieties were in early December cut longitudinally into four sections, being careful to preserve some of the crown on each piece. Potted and removed to a warm greenhouse, good growth was recorded on all uninjured root pieces. The method might be useful to carrot breeders and in physiological researches where identical genetic material is desirable.

Harvesting and curing of garlic to prevent decay, H. P. SMITH, G. E. ALTSTATT, and M. H. BYROM (*Texas Sta. Bul. 651 (1944), pp. 28, illus. 10*).—A survey in 1935 of the garlic producing industry in Lavaca and Fayette Counties showed certain poor practices such as saving culls for seed plants and careless harvesting methods that were giving disastrous results. In an experiment in Lavaca County, a total of 25 strains and varieties of garlic were compared as to disease resistance, market quality, etc. Most of the foreign strains gave poor yields due to small bulbs or matured too late. The Mexican and Louisiana Italian strains ripened 10–15 days earlier than the Texas White variety, but produced small bulbs and low yields. Delayed germination, poor stands, and lower yields were generally obtained when fungicides were applied either in the furrow or to the seed pieces before planting. Much better results were obtained by the use of selected, nearly disease-free seed pieces. Curing of garlic for 10–14 days on wire racks, placed in open sheds or in a barn loft, resulted in less decay during 3.5-mo. storage than when cured by artificial heat or by exposure in the field or on the barn floor. A list is presented of the fungi isolated most frequently from decaying garlic. Garlic mosaic was found to be transmitted through the seed pieces, and the early destruction of all plants with streaker or mottled leaves is urged. Practical suggestions are given for planting, harvesting, and curing the crop.

Comparison of yield between trellis-grown and ground-grown plants of the dishrag gourd, R. E. WESTER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 497–500, illus. 2*).—Trellis-grown plants outyielded those allowed to run on the ground and also produced higher quality fruits. The species *Luffa aegyptiaca* requires a longer period in which to mature its fruits than does *L. acutangula*. At Beltsville, Md., the growing season is too short to mature the bulk of *L. aegyptiaca* fruits before frost even when plants are started under glass.

The growth of spinach on phosphorus deficient soil, V. A. TIEDJENS and L. G. SCHERMERHORN. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 506–510*).—Sassafras light loam, pH 5.0, taken from an area on which little except poverty grass had been growing for several years, was placed in glazed crocks and in glass-front boxes. The addition of calcium limestone had a marked effect in increasing yield of spinach, apparently releasing phosphorus from the soil, which enabled the seedlings to contact fertilizer placed in bands below the surface. There was no evidence that phosphorus was made unavailable on acid soil, but the possibility of toxicity of aluminum, iron, or manganese being minimized by the application of phosphorus in solution is not excluded. Various placements of fertilizers were ineffective in promoting growth because the roots could not contact the material due to lack of phosphorus in the soil. The value of a starter solution in growing spinach with less fertilizer is emphasized.

Effect of temperature and photoperiod on seedstalk development in turnips, E. S. M. SAKR. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 473–478*).—Exposure to low temperature is essential for stalk formation under field conditions. The longer the exposure to low temperature the higher was the percentage of seeding, and continuous exposure to cool environment was more effective in the initiation and development of seedstalks than was alternate treatment. Exposure of plants to coolness immediately after germination resulted in earlier seeding than when the exposure was delayed until the plants were 1 mo. of age. During the short days of winter lengthening the photoperiod to 16 hr. hastened the development of seedstalks and tended to increase their percentage. Lengthening the day beyond normal in the period of March to May had no appreciable effect on seedstalk development.

Xylem formation from ring grafts, A. F. YEAGER. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 221–222, illus. 1*).—Ring grafting had been suggested as a simple means of establishing an intermediate section of another variety in the trunk of a young apple tree. To determine whether the xylem tissue developing after the ring graft was made would originate from the stock or from the scion, the author grafted rings of the Scugog apple, a variety with purple xylem, on ordinary varieties and vice versa. In every case where Scugog was ring grafted on white wood, a sharply-marked ring of purple wood was laid down subsequently. The reverse was also true. All new xylem originated from the bark, which showed vascular continuity with the stock only at the ends. The results suggest the possibility of using the ring graft to test various interstocks, such as the dwarfing Malling IX.

Certain stock-scion incompatibilities and uncongenialities in the apple J. K. SHAW and L. SOUTHWICK. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 239–246, illus. 1*).—The clonal rootstock Spy 227 proved to be incompatible with certain varieties and strains of apple, the latter apparently identical. The same varieties and strains were entirely compatible with other clonal stocks and even with seedlings of Spy 227. Incompatibility was shown by retarded growth, premature leaf coloring and dropping, and by actual death of the tree. The distal parts of the root system appeared to fail first. Apparently, this type of incompatibility may result from somatic variations within the tissues of the tree. Incompatibilities observed between flowering crabs and clonal stocks, especially dwarfing stocks, appear to be of a different nature. In this case the bud may adhere to the stock but fail to grow.

Second-year changes in apparent vigor of apple varieties of prospective value as trunk-formers, F. C. BRADFORD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 215–220*).—Groups of trees constituted, on the basis of first year performance, from the 11 varieties ranking highest, respectively, in budling length, in trunk cross section, and in first year graftability furnished only 3, 4, and 3 members, including duplications, to the group of 11 ranking highest in graftability a year later. Apparently only the lowest group in whip length may be discarded safely on the basis of first year's growth. If the 11 varieties making less than 80 percent of the whip growth of Virginia Crab had been eliminated, only one comparable to Virginia Crab in graftability would have been lost. Had all varieties failing to equal Virginia Crab in whip growth been discarded on the basis of the first year performance, two varieties equaling Virginia Crab in graftability would have been eliminated.

Studies in the metabolism of apples.—I, Preliminary investigations on internal gas composition and its relation to changes in stored Granny Smith apples, S. A. TROUT, E. G. HALL, R. N. ROBERTSON, F. M. V. HACKNEY, and S. M. SYKES (*Austral. Jour. Expt. Biol. and Med. Sci., 20 (1942), No. 3, pp. 219–231, illus. 9*). —Working with the Granny Smith apple, a variety of major importance in Australia, there was found a highly significant correlation between the internal O_2 concentration and respiration rate for coated fruits, but this did not hold always for untreated fruits. The rate of respiration was probably limited by internal O_2 supply. The internal concentration of CO_2 was not apparently increased by coatings and was not correlated with the respiration rate in either coated or control fruits.

In untreated Granny Smith apples held at 21.1° C. after various periods of storage at 1.1°, the respiration rate decreased with time at a fairly steady rate. This decrease was frequently associated with a decrease in the concentration of internal O_2, probably due to an increase in the resistance of the fruits to gaseous diffusion. Within the temperature range of 7.0° to 47.0°, there was a progressive increase in CO_2 and decrease in O_2 as the temperature rose. Changes in the composition of the external atmosphere were reflected by changes in the internal atmosphere. In untreated fruits the rate of coloring was related to the internal O_2 concentration.

Studies in the metabolism of apples, II, III, F. M. V. HACKNEY (*Linn. Soc. N. S. Wales, Proc., 68 (1943), pt. 1–2, pp. 33–47, illus. 6; pp. 48–56, illus. 5*).—Two studies are noted.

II. *The respiratory metabolism of Granny Smith apples of commercial maturity after various periods of cool storage.*—In Granny Smith apples which had been held less than 3 or 4 mo. at 1° C., the respiration rates declined steadily when removed to 21°. The declining respiration rates were associated with decreasing internal O_2 concentrations and increasing resistance to the diffusion of O_2. At this stage the respiration rate was apparently governed by the internal O_2 concentration rather than the CO_2 concentration. After more than 5 mo. of storage, the respiration rates showed frequently marked fluctuations with a usual downward trend. In these older fruits internal O_2 concentration was apparently determined by both respiration rate and rate of increase of the resistance of the skin to O_2 passage. Alcohol determinations suggested that a small amount of anaerobic respiration occurs when the internal O_2 concentration is low.

III. *Preliminary investigations on the effects of an artificial coating on the respiratory metabolism of Granny Smith apples after various periods of cool storage.*—A record is given of observations on Granny Smith apples which were coated with a 10 percent solution of castor oil and shellac in alcohol, after various periods of storage at 1.0° and then held at 18.3° to soften. The coatings depressed the internal O_2 concentration and caused a temporary increase in the internal CO_2 concentration and a depression of the respiration rate and retardation of the coloring rate. The resistance of the skin to the diffusion of CO_2 was increased by the coating. In fruits taken from storage late in the season the decrease in internal O_2 concentration due to coating may have initiated anaerobic respiration.

Responses of young Elberta peach and Montmorency cherry trees to potassium fertilization in New York, D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 31–33*).—Experiments conducted on a fruit farm located on Dunkirk silt loam in Niagara County, N. Y., showed beneficial results to Elberta peaches and Montmorency cherries from applications of muriate of potash. In both fruits the treated trees were, before K applications, unthrifty and showing definite symptoms of leaf scorch. Two applications to the peaches of 3.0–3.5 lb. of muriate of potash in October and the following April produced striking recovery. Shoot growth was in some cases 18–24 in. on the treated and only 1–2 in. on the paired checks. There was a great increase in percentage of K in the leaves. Good, although not so striking, results were recorded in the cherries, and the K content of the leaves was also greatly increased by K applications.

Some factors affecting the quality of dried prunes, A. H. HENDRICKSON and F. J. VEIHMEYER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 205–210*).—Specific gravity of prunes is apparently not correlated with yields expressed either as weight or numbers of fruits per plot. Specific gravity was apparently not correlated with that fraction of the sugar content known generally as total sugar, probably because of the presence of air pockets in the flesh of dried prunes. Specific gravity appeared to be inversely correlated with high temperatures during the growing season. Temperatures of 105° F. or above appeared to be about seven times as injurious as those between 102° and 105°.

Currant and gooseberry culture in Ohio, W. P. JUDKINS (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 243–245*).—General information is presented on varieties, propagation, planting, culture, pruning, protection from insect and disease pests, etc.

Effect of phosphate fertilizer upon the growth and yield of the Carman grape in north Texas, U. A. RANDOLPH. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci.

Proc., 44 (1944), pp. 303–308).—Carman grapes planted in 1938 responded markedly to phosphate fertilizers, and the yields were increased to a profitable degree. The phosphorus-treated vines were more vigorous and produced more and larger clusters. Vines receiving P in combinations with N were slightly more productive than those receiving the complete fertilizer or P and K. A treatment of N and K had no significant effect on the number and size of clusters but did improve growth slightly. Stable manure had the greatest effect on vine growth. All treatments reduced the sugar content of the juice, apparently in direct ratio to the increased yield and vegetative growth.

Effect of cluster removal upon fruit of vinifera grapes, F. N. HARMON and E. SNYDER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 309–311*).—Reducing the number of clusters per vine of eight varieties of vinifera grapes resulted in earlier fruit maturity. However, since there was very small or no increase in berry weight, the total yield per vine was actually reduced by cluster thinning. Unthinned vines with excessive crops showed reduced vigor compared to thinned vines, and light cluster thinning appeared advisable to maintain adequate vigor for production in succeeding years. There was a slight tendency for a sugar percentage increase in the fruit of the cluster-thinned vines, but this was not sufficient to offset the loss of sugar in the removed clusters.

Drying different vinifera grape varieties for raisins, E. SNYDER and F. N. HARMON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 201–204*).—A total of 27 varieties was dried and compared with commercial raisins. In general, the table types such as Alphonse Lavallee, Flame Tokay, and Malaga required a longer period for drying than did wine types with smaller berries such as Mission, Petit Syrah, and Sauvignon Vert. Many of the wine varieties had more seeds and a higher percentage of raisin product made up of seeds than the table and raisin varieties. Monukka made an acceptable raisin, except for dark color and variable size. Very few of the wine varieties made raisins that would meet commercial standards, but certain of the table and wine varieties could be used for raisins in time of shortage.

Influence of cryolite and sodium fluosilicate on the quality and fluorine content of oranges, P. J. HAMERSMA (*Farming in So. Africa, 19 (1944), No. 219, pp. 366, 370*).—An abstract of extensive orchard tests of cryolite and sodium fluosilicate as dusts and sprays, in which the quality of the fruit with respect to juice and acid content, total soluble solids, and vitamin C is reported to have been in no way adversely affected; in other words, the fluorine insecticides did not have the adverse effect peculiar to arsenicals. The F content of the skin and of the fruit when treated only in the early stage was negligible, not exceeding that of untreated oranges under the same conditions. Washing is necessary after late dusting or spraying.

The value of utilizing existing shade in the growing of vanilla, E. H. MEDINA (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 3, pp. 117–124, illus. 3*).—Vanilla grown on bucare supports under shade produced more root germination, less seed-piece rotting, and more vegetative growth than when grown on the same kind of support trees on cleared land. The vines under shade were of a healthy dark-green color as compared with yellowish green in the open. Because of the habit of dwarf bucare in shedding its leaves in the dry season, when vanilla needs shade, it is desirable to use this support tree only under shaded conditions.

Relation of moisture content to quality of vanilla beans, F. E. ARANA and A. G. KEVORKIAN (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 3, pp. 105–116, illus. 2*).—Curing of vanilla beans is accompanied by a loss of moisture, which starts during sweating and continues throughout drying and conditioning. Loss in weight other than that due to moisture loss was insignificant. Moisture content affected the appearance and aroma of the beans, but did not influence the phenol value. Beans with a moisture content of 31 to 34 percent had a well-developed and satisfactory aroma and possessed a high degree of flexibility. A higher moisture content lead to a fermented aroma and a low moisture content to a satisfactory aroma but little flexibility. Commercial lots of vanilla beans from Mexico, Madagascar, the Comoro Islands, and Tahiti were found to contain over 30 percent moisture.

The budding of tung (Aleurites fordii Hemsl.), S. Merrill, Jr. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 227–235, illus. 1*).—Over a 3-yr. period some 78,000 tung seedlings have been budded at Bogalusa, La. When fall budding was compared with spring, the respective percentages of success were 80 and 72. Buds placed in autumn are banked with soil in early November and uncovered in early April. Late August and early September were promising for budding. Certain rootstocks tend to harden early in the fall, hence are not suitable for late fall budding. In general, stocks that bud easily early in the spring bud poorly late in the season and vice versa. The T-bud was found well suited to tung propagation. Soil texture and fertility conditions unfavorable to growth of rootstocks caused a marked reduction in percentage of successful budding.

Culture studies of the drug plant Atropa belladonna, W. R. Brewer and A. Laurie. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 511–517*).—The results reported in this second contribution (E. S. R., 89, p. 316) had been noted from another source (E. S. R., 91, p. 548).

Studies on clonal strains of pyrethrum, B. D. Drain, W. A. Simanton, and A. C. Miller. (Tenn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 521–524*).—The insecticidal value of individual plants grown from commercial seed ranged from extremely low to fairly high values. Chemical and biological methods of assaying pyrethrins agreed very well when applied to mixtures of flowers from several plants. When applied to flowers of individual plants, the agreement was close in 12 of 23 plants and differed markedly in a few cases. Clonal strains were found to maintain their respective pyrethrin ratings, although some variance was noted from year to year. Cuttings or small crown divisions may be used for propagation of high pyrethrin plants.

The effect of temperature on bloom color of roses, J. C. Ratsek. (Tex. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 549–551*).—Talisman and Briarcliff rose plants growing in 6-in. pots, were placed at three temperatures 65°, 80°, and 95° F. The plants at 95° grew rapidly at first with normal size but pale blooms. Soon, however, blooms became small and the color nearly pure white. Plants at 80° grew well with large flowers on long stems, but the color was somewhat pale. Plants at 65° produced large blooms of a good deep color. Foliage was succulent and of a brilliant green hue. High concentrations of starch were found in the stems of the 65° roses. At 80° starch was found in the same locations as at 65°, but was less concentrated. The 95° wood contained no starch at all. The author concludes that the pale color of roses in mid-summer is due to insufficient carbohydrates and not to bleaching by sunlight. The necessity of preventing defoliation by leafspot in order to maintain the carbohydrate supply is stressed.

Preliminary studies on low-temperature vernalization of column stocks, Mathiola incana, J. E. Howland. (Cornell Univ. coop. Mich. State Col.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 518–520*).—Column stocks of five commercial varieties were unaffected in time of flowering in 2-yr. trials of certain low-temperature thermophase vernalization treatments. Percentages for seed germination were reduced by all treatments and progressively as the length of the treatments was increased. Quality of flowers and stem length were not affected.

FORESTRY

Studies in tolerance of New England forest trees.—XV, Soil temperature as influenced by the density of white pine cover, G. P. Burns (*Vermont Sta. Bul. 513 (1944), pp. 35, illus. 2*).—Continuing the series (E. S. R., 89, p. 680), the author reports that air and soil temperature records taken over a 10-yr. period and during a sample year in three locations, (1) natural forest of 40–60-year-old white pine with a few hardwoods, (2) same forest thinned, and (3) an adjacent open area, revealed many inconsistencies but certain definite facts. Many of the apparently aberrant results may be explained by the amount, the drifting, and seasonal distribution of the snowfall. For example, a heavy snow in November that lay on the soil all winter prevented further freezing of the soil and actually permitted the underlying ice to melt. In late spring, snow remained in the heavily forested area after it had disappeared from the other two areas. Alternate freezing and thawing occurred more often in the open-control area soil than in the forest. However, there were so many variations that averages would give a false conception of habitat conditions. Critical periods occurring at any time of the year may be decisive in determining the survival of forest seedlings, which comprise the reproduction for the future forest. On the whole, fluctuations in soil temperatures in forest stands are largely independent of fluctuations in air temperatures.

Effect of seed weight and seed origin on the early development of eastern white pine, S. H. Spurr (*Jour. Arnold Arboretum, 25 (1944), No. 4, pp. 467–480, illus. 3*).—Lots of white pine seed, each collected from a single mother tree, were obtained from Massachusetts, New Hampshire, New York, and the Province of Ontario. One hundred seeds of each of 10 lots were weighed individually and handled as separate units. Heavy seed germinated better and earlier and the seedlings survived in a higher proportion than those from lighter seed of the same lot. Shoot weight at the end of the first year was closely correlated with seed weight, but as the plants grew older this correlation decreased although still highly significant at the end of the third year.

The effect of origin was also evident, and the variation in growth between lots was generally consistent from year to year and was highly significant at all times. Lot 7 (one of the three obtained from New York State) was the fastest growing in all 3 yr., with lot 1 (one of the three from Massachusetts) following closely. There was an apparent tendency for the New Hampshire lots to grow more slowly, but the numbers were inadequate to permit deductions.

Loblolly pine seed production and dispersal, G. M. Jemison and C. F. Korstian. (U. S. D. A. et. al.). (*Jour. Forestry, 42 (1944), No. 10, pp. 734–741, illus. 3*).—Over a period of 8 yr., observations were made on seed production and seed distribution in a 70-year-old fully stocked stand of loblolly pine, located in the Duke Forest at Durham, N. C. In the 8 yr., there were produced two good, three medium, and three poor crops. The greatest fall of seed occurred within and closely adjacent to the stand. During the first 4 yr., 39 per cent as much seed fell on the portion of a clear-cut strip 100 to 132 ft. down wind from the stand as under the timber canopy. In the second 4 yr., 34 per cent as much seed was caught in a portion of a cleared strip 199 to 264 ft. distant, as under the complete canopy.

Viability of seed as determined by cutting tests varied from 29 to 57 per cent from year to year with highest readings in good seed years. There was no relation between viability and the distance at which seed fell from the trees. Seed fall began about October 20 and reached a peak in early November. Warm, dry, windy periods tended to increase seed fall. The results indicated that alternate strips 150–200 ft. wide at right angles to the prevailing wind direction, or patches 150–200 ft. across, can be safely clear-cut if bordered by well-stocked, seed-producing stands on the windward side.

Northern white cedar on upland soils in Maine, J. D. Curtis. (Univ. Maine). (*Jour. Forestry, 42 (1944), No. 10, pp. 756–759*).—Observations covering a period of 3 yr. indicate that old-field cedar, if it can be effectively managed, is a valuable timber crop, particularly for farmers, in many parts of Maine and southern Quebec. A description is presented of some of the characteristics of the old-field type of cedar, and data are offered on the results of a thinning experiment.

A vernier tree-growth band, R. C. Hall. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 10, pp. 742–743, illus. 3*).—A description is offered of the construction and use of a homemade instrument that makes possible the accurate measurement of diameter growth at any time during the growing season.

Where and when to measure forest-fire danger, G. L. Hayes. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 10, pp. 744–751, illus. 1*).—Under the conditions prevailing in the Priest River Experimental Forest in northern Idaho, a single measurement taken daily at noon at either a valley bottom or a south slope station is considered adequate for rating the fire hazard. Actually a combination of two daily measurements gave more representative burning index values than did single observations, and three daily measurements improved the accuracy even further. However, few organizations are sufficiently flexible to use effectively burning indexes more precise than those based on single daily measurements.

Decay of logging slash in the Northeast, P. Spaulding and J. R. Hansbrough. (Coop. Pa. State Col. et al.). (*U. S. Dept. Agr., Tech. Bul. 876 (1944), pp. 22, illus. 2*).—Logging slash and other forest debris after cutting present very dangerous fire hazards. Disposal by broadcast burning kills advance reproduction and causes site deterioration, and burning in piles is expensive; the only practical alternative is to leave the slash in such condition as to favor rapid decay. In this several years' study of experimental plots in different situations in New York and New England the average periods required for disintegration were 15 yr. for hardwood, 17 yr. for eastern white pine, and 29 yr. for red spruce; under the most favorable conditions for decay these periods could be shortened by about one-fifth. Unfavorable moisture and temperature retarded decay—in some cases by many years. Hundreds of fungi helped to disintegrate slash, but about 50 caused the greater part. The primary factors in the activities of slash-decay fungi were moisture, temperature, and the resistance of the wood. Since air as well as moisture is necessary, these fungi cannot work in entirely waterlogged wood; neither were they very active below 40° F., requiring temperatures of 70° or over for most rapid decay. The heartwood of the more durable species rotted much more slowly than the sapwood of any species. Slope, aspect, altitude, and soil type are also important in their effects on moisture and temperature but cannot be altered materially by man; fortunately the primary factors can be changed by proper forestry operations.

A short rotation was found to result in less slash per acre and a larger proportion of the fast-decaying sapwood. Because broken crown cover maintains a more uniform moisture, partial cutting also usually favors more rapid decay of slash; clear-cutting is likely to have the opposite effect. Under most conditions, scattered slash rots faster than that piled or windrowed. Lopping the slash of conifers and of the more durable hardwoods favors decay but the costs are heavy; it is to be avoided on wet sites and for easily waterlogged species. In making partial cuttings, care is needed to keep logging injuries to residual trees at a minimum and thus to prevent fungus damage by trunk infections. Independent ratings indicated a close correlation between volume of slash and fire danger. Accompanying graphs show the reduction of fire danger with increasing age for slash of hardwoods, eastern white pine, and red spruce. There are 21 references.

DISEASES OF PLANTS

The Plant Disease Reporter, [August 22 and September 1, 7, 15, and 22, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 26, pp, 823–846; 27, pp. 847–872; 28, pp. 873–895; 29, pp. 897–924, illus. 4; 30, pp. 925–944*).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals and grasses, field legumes, potatoes, vegetables, fruits, special crops, and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 26.—Chlorotic dwarf of eastern white pine, by R. U. Swingle; bacterial leaf blight and top rot of corn in Nebraska and Kansas, by S. M. Pady; and diseases observed on soybeans in Missouri, by T. W. Bretz.

No. 27.—Tobacco diseases in Virginia, 1944, by E. K. Vaughan and W. A. Jenkins; diseases observed on potatoes in northern California, by H. L. Barnett; potato diseases in Wisconsin, by E. E. Honey; bean diseases in the Willamette Valley of Oregon, by L. W. Boyle; bacterial wilt of corn in Iowa, by E. F. Vestal; soybean diseases in Arkansas, by H. W. Larsh; and soybean diseases in Wisconsin, by E. E. Honey.

No. 28.—Potato diseases and injuries in Maine, by R. C. Cassell; tomato diseases in southeastern Iowa, by E. F. Vestal; bean diseases in New York, by J. S. Niederhauser and in Colorado and Wyoming, by E. W. Bodine; diseases observed on wormseed in Maryland, by E. A. Walker; diseases on cotton in Texas, by G. E. Altstatt; alfalfa and clover seed situation in northern Minnesota, by I. W. Tervet; peanut diseases in southeastern Alabama, by G. M. Stone; soybean diseases in Maryland, Delaware, and New Jersey, by E. A. Walker; and diseases of small grains in Virginia in 1944, by E. K. Vaughan.

No. 29.—Epidemic of charcoal rot of corn and other crops in east Texas, by P. A. Young and its incidence in north and east Texas, by G. E. Altstatt and P. A. Young; diseases of corn in Illinois, by J. S. Tidd; sweetpotato stem rot in Georgia, by J. H. Miller; and orange rust a market factor in Colorado spinach, by G. B. Ramsey and M. A. Smith.

No. 30.—*Cephaleuros virescens* on *Cinchona* in Central and South America and the occurrence of *Cinchona* root rots in the Americas, both by B. S. Crandall and W. C. Davis; phloem necrosis of elms in Missouri, by T. W. Bretz; dying of elms in Indiana, by J. S. Tidd; fruit diseases in Oklahoma, by H. W. Larsh; a disease of guayule caused by *Sclerotium bataticola,* by J. T. Presley; diseases of cigar-wrapper tobacco in Florida, 1944, by R. R. Kincaid; cotton diseases in Oklahoma and Arkansas, by H. W. Larsh; and observations on Mississippi tomato diseases in seedbed and field and in handling and marketing operations, by H. H. Foster and L. P. McColloch.

Report of the twenty-seventh annual meeting of the Pacific Division of the American Phytopathological Society (*Phytopathology, 34 (1944), No. 10, pp. 933–937*).—Abstracts of papers on the following subjects are presented: Walnut blight; *Phytophthora* root rot and *Verticillium* wilt of guayule; bacterial black streak and *Phoma* infection of sugar beet; virus diseases of peach, cherry, and other stone fruits; potato leaf roll; stem smut and blind seed diseases of grasses; bean rust; alfalfa witches' broom; bacterial blight of purple vetch; *Cercosporella* disease of cabbage; overwintering of powdery mildews; and $CuSO_4$ as an eradicant spray in greenhouse and field and fungicide and vapor heat seed treatments.

Troubles respiratoires: Fièvre végétale, J. Dufrenoy and H. B. Humphrey (*Rev. Canad. Biol., 3 (1944), No. 3, pp. 305–311; Eng. abs., p. 310*).—The authors summarize this critical discussion (11 references) as follows: "A fungus that attacks a plant tissue engenders within the cells, even before they are infected, a 'dispersal' of the phosphoric compounds upon which respiration depends. If the cells survive these respiratory difficulties, releasing in toto the phosphoric compounds, on which the fungus thrives, the plant is susceptible and the fungus behaves as a 'parasite.' If the cells are the seat of a severe decompensation of respiration, the phenolic compounds of the vacuolar solution are dehydrogenized with the production of 'quinones,' which 'fix' the cytoplasm. The fungus, incapable of establishing itself as a parasite, behaves as a pathogen that remains localized within a necrotic lesion."

Deficiency, toxicity, and accumulation of boron in plants, F. M. EATON. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 6, pp. 237–277, illus. 7*). —Comparative studies were made on 54 plant species (60 vars.) grown in outdoor sand cultures supplied respectively with 0.03–0.04, 1, 5, 10, 15, and 25 p. p. m. of B at Riverside, Calif., during May 1930 to March 1934. The largest growth of 25 percent of the plants was made in the trace cultures, and the remaining ones responded to 1 p. p. m. or more of B; growth of a number of varieties was increased by concentrations as high as 10 and 15 p. p. m. Among the 60 varieties, 20 developed morphological symptoms of B deficiency when grown in traces and the maturity of 4 was prominently affected; 4 varieties were more subject to mildew with traces than in the higher concentrations. Considerable overlapping was found between the injurious and beneficial effects; mild to marked leaf injury was observed in 19 of the 72 plants (including repetitions) at or below the substrate concentration resulting in largest growth. The B concentration in the leaves of plants (dry weight basis) grown in 5 p. p. m. ranged from 58 to 1,804 p. p. m. and in 25 p. p. m. from 209 to 3,874 p. p. m. The B concentration in roots, stems, and fruits was generally much lower than in leaves; that in entire plants tended to average about half as much as in the leaves.

Numerical values for the tolerance to B were derived by dividing the average of the dry weights in the 5, 10, and 15 p. p. m. cultures by the weight in traces or 1 p. p. m. (whichever was higher) and multiplying this quotient by 100. These values ranged from below 10 for highly sensitive to above 200 for the most tolerant plants. The ratios of the concentration of B in leaves to that in the nutrient solution were usually 400–1,200 in traces and 50–200 in 1 p. p. m.; lower ratios were found in the higher concentrations. Little relation was found between the tolerance of species to B and the extent to which they accumulated it. After entering the leaf tissues of most plants B tended to remain there, little being moved out with sugars to other tissues, but in the stone fruits translocation to the bark and wood and subsequently to the fruit flesh took place readily. Comparisons between the concentration of B in the sap expressed from frozen leaves and that estimated as possible on the basis of the moisture content and B of entire leaves indicated all or nearly all of it to be in solution in the leaves of 11 species and about half of it in 3 other species. The restricted movement of B is believed due to its attachment to large or otherwise immobile molecules. Relative to the concentration in the leaves, less B was moved into the roots of onions, radishes, and carrots in summer than in winter. B deficiency in a number of the plants was more pronounced in bright than in cloudy summers and in summer than in winter, indicating that conditions restricting its movement from leaves to meristematic tissues is a highly important factor in the B requirements of plants.

Untersuchungen über die Gattung Hysterographium Corda, insbesondere über Hysterographium fraxini (Pers.) de Not. [Studies of the genus Hysterographium, with special reference to H. fraxini], H. ZOGG (*Phytopathol. Ztschr.*, *14* (*1943*), *No. 4, pp. 310–384, illus. 56*).—*H. fraxini* is found to be a nonspecialized facultative saprophyte, at the start requiring dead tissues from which, however, it can spread into living tissues, but only when the host plant is in a weakened condition. Both primary and secondary spores were formed in culture. The fungus is homothallic and develops according to the *Neurospora sitophila* type. The microconidia behave as vegetative structures. As one result of this investigation, the 25 named species studied are brought together under the following 5 species as here emended by the author: *H. fraxini, H. mori, H. formosum, H. elongatum,* and *H. flexuosum.* There are over two pages of references.

Der Einfluss partieller Sterilisation des Bodens auf die Entwicklung der Laufhyphen von Ophiobolus graminia [The influence of partial sterilization of the soil on the development of the running hyphae of O. graminia], A. G. Winter (*Phytopathol. Ztschr., 14 (1942), No. 3, pp. 204–302, illus. 9*).—This monographic study (7-page bibliography) of the above relationship considers the biological and ecological characteristics of the mycelium of the take-all fungus, the problem of partial sterilization of the soil and of the fungus, the methods used in the study, the relation of the nutrient content of the soil to the development of the running hyphae and saprophytic mycelium of the fungus, and the antagonism of the edaphon and its significance in relation to the effects of partial sterilization.

Recherches cytologiques sur les tumeurs à Phytomonas tumefaciens, R. Garrigues (*Compt. Rend. Acad. Sci. [Paris], 217 (1943), No. 9, pp. 235–237*).—In experiments with two species (sunflower and pelargonium) known to respond favorably to inoculation with *P. tumefaciens,* the author confirmed the results reported by Riker (E. S. R., 60, p. 545) and others in that no polyploid nuclei were found. These results are opposed to the findings in animal and human cancerous tumors where a large number of atypical (including polyploid and multipolar) figures occur, suggesting disturbances comparable to those of the colchicine-induced type. It is believed that present knowledge as a whole serves to separate rather than to unite these two types of tumors.

Production of a soluble pectinase in a simple medium by certain plant-pathogenic bacteria belonging to the genus Pseudomonas, A. E. Oxford (*Nature [London], 154 (1944), No. 3904, pp. 271–272*).—The six active strains found were *P. tabaci, P. mors-prunorum, P. syringae* (2 strains), *P. cerasi,* and *P. marginalis*—the last two and one strain of *P. syringae* outstanding. Seven strains of *P. mors-prunorum,* 6 of *P. syringae,* and all strains tested of *P. prunicola, P. syringae* from sources other than pear, *P. phaseolicola, Bacterium tumefaciens, Xanthomonas pruni,* and ordinary saprophytic strains of *P. fluorescens* were all inactive.

Morphology, cytology, and parasitism of Thekopsora hydrangeae, L. S. Olive (*Jour. Elisha Mitchell Sci. Soc., 59 (1943), No. 1, pp. 45–67, illus. 155*).—The heteroecious rust fungus here studied is reported to occur abundantly in the mountains of North Carolina on Canadian hemlock (*Tsuga canadensis*) and on several species of *Hydrangea.* Its pycnia occur in spring on both surfaces of hemlock leaves, but more commonly on the lower surface. Aecial primordia appear in the leaf as tangled wefts of hyphae on either side of the midrib; the aeciospores infect the hydrangea in early summer. Uredinia develop from compact groups of swollen vertical hyphae which appear next to the lower epidermis of the leaf. Mature uredinia rupture the lower epidermis to expel spores which reinfect the hydrangea during the latter part of summer. The teliospores overwinter in fallen hydrangea leaves to germinate the following spring and produce regular 4-celled basidia. Each basidium gives rise to 4 sporidia; these infect the hemlock and the cycle is completed. Cytological and developmental details in the life history of the fungus and the host-parasite relations are presented and illustrated in detail.

A virus attacking lettuce and dandelion, B. Kassanis (*Nature [London], 154 (1944), No. 3896, p. 16*).—The name "dandelion yellow mosaic virus" is suggested for this aphid-transmitted agent. Artificial inoculations with use of an abrasive were successful. The symptoms are briefly described.

Combination of potato virus X and tobacco mosaic virus with pepsin and trypsin, A. KLECZKOWSKI (*Biochem. Jour., 38 (1944), No. 2, pp. 160–167, illus. 1*).—Pepsin combined with potato X virus and casein—substrates for its proteolytic activity, but not with tobacco mosaic virus—not a substrate. The latter virus denatured by heat was readily hydrolyzed by pepsin and combined with it almost to the same extent as did potato X virus. Invertase failed to combine with the X virus, with tobacco mosaic virus—whether heat-denatured or not, or with casein. More trypsin combined with tobacco mosaic virus—not a substrate for proteolytic activity—than with potato X virus—a substrate. Combination of trypsin with tobacco mosaic virus could account for the reversible inhibition of infectivity of the virus by trypsin; combination between trypsin and tobacco mosaic virus protected trypsin from spontaneous inactivation at pH 7. Trypsin and invertase adsorbed on charcoal can be set free by casein; invertase can also be extracted by tobacco mosaic virus but not by sucrose.

Studies of dodder transmission of plant viruses, C. W. BENNETT. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 10, pp. 905–932, illus. 3*).—Cucumber mosaic, dodder latent mosaic, curly top, spotted wilt, and mustard mosaic viruses were transmitted via *Cuscuta subinclusa, C. campestris,* and *C. californica.* A low percentage of plants inoculated with tobacco mosaic via *C. subinclusa* and *C. campestris* became infected and no infection was obtained via *C. californica.* The virus of tobacco etch was transmitted only by *C. californica,* and those of sugar beet mosaic, sugar beet yellow vein, tomato ringspot, citrus psorosis, and peach mosaic were not transmitted at all. Transmission appeared to be correlated to a greater or lesser degree with the longevity and concentration of the virus in the dodder host. The virus of dodder latent mosaic was transmitted through 2.4 and 4.9 percent of the seeds of *C. californica* and *C. campestris,* respectively. Movement of the viruses of curly top and cucumber mosaic in dodder stems was much more rapid toward growing points and away from the host than in the opposite direction. Growth of dodder on one shoot of beet plants with three shoots on a single root system induced movement of curly top virus from an inoculated shoot in 32–46 days; check shoots remained free of symptoms for 113–149 days. Viruses appear to be acquired by dodder mainly by movement from the host into the parasite through the phloem with the food materials. Infection is believed to occur (1) by movement of virus from the phloem of dodder through the haustorium into the phloem of the host and (2) by passage from the parenchyma of the haustorium into that of the host through plasmodesmatal strands or from naked protoplasm of the invading hyphalike cells. It is suggested that infection by the yellow-type viruses may be effected by the first method and that infection by mosaic-type viruses may be effected chiefly by the second.

Inhibition of metal catalysis as a fungistatic mechanism, G. A. ZENTMYER. (Conn. [New Haven] Expt. Sta.). (*Science, 100 (1944), No. 2596, pp. 294–295*).—Traces of metals apparently function as part of one or more enzyme systems in micro-organisms. The evidence here presented strongly supports the view that 8-hydroxyquinoline owes its fungistatic action to the forming of inner complex salts with metal ions, thus rendering them unavailable to micro-organisms. A chemical with this type of mechanism of action would obviously be fungistatic rather than fungicidal. The possibility is evident that other materials may be effective fungicides because of similar precipitation of metals essential to fungi.

Zur Methodik der laboratoriumsmässigen Prüfung von Beizmitteln [A laboratory testing method for fungicides], G. GASSNER (*Phytopathol. Ztschr., 14 (1943), No. 4, pp. 303–309, illus. 4*).—As based on the experimental work reported, the author proposes testing seed disinfectants against bunt by placing the spore-dusted and treated seeds in sterile soil and leaving them there until germinated.

After removal and holding for 2-3 days longer, the disinfectant action of the chemical is indicated by the absence or comparative lowering of the spore-germination level. The findings from this test were correlated with simultaneously conducted field tests.

Organic fungicides in 1944, A. B. GROVES. (Va. Expt. Sta.). *(Va. Fruit, 32 (1944), No. 9, pp. 13-14).*—A seasonal note, with special reference to Fermate in orchard use.

Beiträge zur Giftwirkung der Quecksilberalkyle [Contribution on the toxic action of alkyl compounds of mercury], G. GASSNER *(Phytopathol. Ztschr., 14 (1943), No. 4, pp. 385-389, illus. 2).*

Cereal diseases, W. C. MOORE *(Nature [London], 154 (1944), No. 3900, pp. 139-141).*—Brief report of a general symposium on cereal diseases motivated by the important place of cereals in the wartime production program and with special reference to Britain. Over 50 cereal diseases have been listed for England and Wales; of these at least 7 (listed) are said to be of some economic importance.

A study of domestic ergot of wheat and rye, A. E. SCHWARTING *(Ohio State Univ., Abs. Doctoral Diss., No. 43 (1943), pp. 151-158).*—From studies of small-scale field culture methods conducted over the growing seasons, infection of rye by *Claviceps purpurea* was found to be materially increased by spraying and brushing methods. Use of conidial suspensions with suitable sprayers is a more practical method, since cultivation of ergot by such procedures does not involve skilled labor; one trained in recognizing the proper time to infect the flowers could accomplish the task with great efficiency. The inoculation medium is easily and inexpensively prepared in the laboratory. Weather conditions prevailing in central Ohio were found well suited to secure high infection. With a mobile sprayer, suitable acreage, and proper methods for moisture control it would be possible to determine whether or not artificial methods are commercially practical in this area.

Stem rust on new wheat varieties and hybrids, H. HART. (Minn. Expt. Sta.). *(Phytopathology, 34 (1944), No. 10, pp. 884-899, illus. 4).*—The percentages of stem rust and the physiologic races of *Puccinia graminis tritici* responsible were determined for nearly 40 varieties and hybrids of wheat grown in field plots (1939-43) and exposed to early and abundant inoculum. The Marquis and Ceres varieties were attacked each year by 2-8 and Rival and Thatcher by 1-6 races of the pathogen. Race 15B attacked many of the new wheat varieties and hybrids and may be a potential danger to wheats throughout the Mississippi Valley unless resistance to it is incorporated into breeding stocks.

Occurrence of Ophiobolus graminis var. avenae on wheat crops in the field, R. W. G. DENNIS *(Ann. Appl. Biol., 31 (1944), No. 2, pp. 100-101).*—This variety of the take-all fungus was found on oats crops in 10 counties of Scotland; it was also shown to attack wheat crops in the same districts.

Effect of several seed protectants on germination and stands of various forage legumes, J. L. ALLISON and J. H. TORRIE. (Wis. Expt. Sta. and U. S. D. A.). *(Phytopathology, 34 (1944), No. 9, pp. 799-804).*—The effects of New Improved Ceresan, Spergon, and Arasan on the germination and stand of alfalfa, white-flowered sweetclover, alsike clover, medium red clover, strawberry clover, and ladino clover were investigated in the laboratory, greenhouse, and field. About 1 percent by weight of each fungicide adhered to the seed; laboratory tests indicated that none of them lowered germination. Spergon retarded but did not reduce germination of strawberry clover and ladino clover but had no such effect on the other legumes. With humus soil in either greenhouse or field—where total emergence and final stand remained the same because no postemergence damping-off occurred—these two species were retarded but not reduced in total emergence. When planted in compost infested with damping-off fungi, however, these species were slowed up and very significantly reduced in total emergence, indicating that the protectant had so retarded germination that pre-emergence damping-off occurred. In compost certain species were protected against pre-emergence damping-off by some of the protectants, but none of them controlled postemergence damping-off with any species. In humus soil only two species were benefited by any of the protectants; in the field none of the protectants was significantly beneficial with any legume treated, but none of them inhibited nodule formation. There appears to be little evidence from these studies to recommend general adoption of seed treatment of these legumes in Wisconsin.

Lawn troubles and their control, B. O. DODGE (*Jour. N. Y. Bot. Gard., 45 (1944), No. 537, pp. 208–214, illus. 3*).—An informatory paper briefly describing the principal lawn enemies individually (fungi, insects, crabgrass) and recommending methods of elimination or control.

Influence of certain soil factors on chocolate spot of beans, H. H. GLASSCOCK, W. M. WARE, and N. H. PIZER (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 97–99*).—Soil samples were collected from 49 affected fields on a variety of soil types, and the relation between severity of attack and their texture, pH, and available K and P were determined. A highly significant relation was found to the amount of available P in the soil as determined by the method of soil analysis used. Damage by chocolate spot was generally slight on soils containing "medium to medium high" or higher amounts of available P, but usually severe on soils containing low amounts of available P. No significant relation was observed between severity of attack and soil texture, pH, or available K content.

California disease-free bean seed production, F. L. SMITH. (Calif. Expt. Sta.). (*South. Seedsman, 7 (1944), No. 9, pp. 15, 40, illus. 2*).

Idaho disease-free bean seed production, M. E. ANDERSON (*South. Seedsman, 7 (1944), No. 9, pp. 14, 40, illus. 2*).

Seedling infection of dent maize by Sclerotium bataticola Taub., G. SEMENIUK. (Iowa Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 838–843, illus. 1*).—This seedling disease of dent corn is described as obtained from greenhouse inoculations. Severe mesocotyl and primary root necrosis with accompanying stunting of seedlings followed only under steamed-soil conditions where the suppression of *S. bataticola* by other soil organisms was reduced to a minimum. Differences among inbred lines and single crosses of dent corn seedlings in susceptibility to the disease were observed.

Infection of cotton seedlings by Colletotrichum gossypii as affected by temperature, C. H. ARNDT. (S. C. Expt. Sta. coop. U. S. D. A.). (*Phytopathology, 34 (1944), No. 10, pp. 861–869, illus. 3*).—When infested seeds were germinated at 18°, 22°, 25°, 29°, 33°, and 36° C., anthracnose lesions appeared earliest at 29° and 33°. Relatively low percentages of seedlings were infected and killed at 33°; at 29° much larger proportions were infected and killed but not so large as at 22° and 25°. The last approximated the optimum temperature for maximum infection and injury to the hypocotyls and cotyledons, 18° greatly reduced the incidence of seedling infection, and at 36° there was no infection at all. All seedlings infected at 25° and 22° were killed before the fourteenth day; at 33° many of the lesions remained small and did not greatly retard seedling growth. The percentages of the seedlings of the lots killed in the laboratory at 22° were indicative of the response of these lots to seed treatment in field plantings.

The importance of cotton seed in the dissemination of Verticillium wilt in California, B. A. RUDOLPH and G. J. HARRISON. (Calif. Expt. Sta. and U. S. D. A.). (*Phytopathology, 34 (1944), No. 10, pp. 849–860, illus. 1*).—Isolations over a 5-yr. period from 3,371 mature cotton bolls on plants severely affected with *V. albo-atrum* showed that the fungus had reached only 150 receptacles and penetrated to the bases only of the placental columns of 2 bolls. Since in no case had it reached the seed, internal infection is highly improbable. Contamination of the lint by spores and microsclerotia is believed equally improbable; 11,723 cultures made from tiny black bodies—erumpent or superficial—on diseased cotton stalks failed to yield the pathogen, indicating that microsclerotia are not produced on the old dead stalks overwintered in the field. Spore production was never observed in the field on any plant in California and probably never—or at least very rarely—takes place. Cotton lint proved a poor medium for the fungus to grow upon; only when constantly saturated in culture tubes did it support growth. It seems highly improbable that such conditions would be found in the field or in cotton piles at the gins. All the evidence is against the infection or contamination of the lint by the fungus on an economically important scale.

Development of mould on the cut surfaces of potato tubers, W. A. R. Dillon Weston and R. E. Taylor (*Jour. Agr. Sci.* [*England*], *34* (*1944*), *No. 2, pp. 93–96*).—Cut potato tissues possess strong inherent healing powers; these were impaired by treatment with salts of Cu, Co, Ni, and Fe. Treatment was followed by mold growth—particularly *Penicillium* spp., this being most profuse with Cu and least with Fe salts. Association between mold growth and treatment with these salts suggested a periodic relationship. Development of *Penicillium* on the tissues after treatment with Cu salts is greater than may be explained solely on the basis of saprophytic growth following phytocidal action and prevention of suberization. Under moist conditions, treatment of nonliving substrates such as straw, leather, and skin with $CuSO_4$ tended to prevent mold growth, whereas considerable development occurred on these materials when untreated.

Relation of sample size to accuracy, K. H. Fernow. (Cornell Univ.). (*Amer. Potato Jour., 21* (*1944*), *No. 8, pp. 229–234*).—The author's conclusions from this statistical analysis and discussion as to what constitutes an adequate sample of potatoes for test purposes with regard to certification differ markedly from the opinion of Folsom (E. S. R., 88, p. 488), this being "due not so much to the different mathematical method as to the different criteria adopted for adequacy. Thus, in the case cited by Folsom where 2,735 tubers are suggested with 3 percent disease present to show that the true amount lies within 1 percent of this amount, the author's argument would be that 400 tubers would be adequate, since we would be satisfied to know the probability that variation was in one direction only and would require odds of 10 to 1 rather than 30 to 1. In practice we usually find it impossible to use samples even of this size so must be satisfied with an error of 2 percent rather than 1 percent."

Fusarium disease of the prickly pear, C. W. Carpenter (*Hawaii. Planters' Rec.* [*Hawaii. Sugar Planters' Sta.*], *48* (*1944*), *No. 2, pp. 59–63, illus. 3*).—Although the pricklypear (*Opuntia megacantha*) is an important forage plant in arid sections it is a detested weed in more fertile sections, rendering some of the best land in Hawaii useless for cultivation or pasturage. A discussion is here given of a destructive disease found due to a fungus; large and small plants have collapsed in 2–5 weeks after inoculation with the causal agent, a variety of *F. oxysporum.* The transmission of this parasite to localities where pricklypear—locally known as "panini"—is a pest has been approved by the Territorial Board of Agriculture and Forestry.

Sorghum diseases and their control, R. W. Leukel, J. H. Martin, and C. L. Lefebvre (*U. S. Dept. Agr., Farmers' Bul. 1959* (*1944*), *pp. 46+, illus. 28*).—Among the numerous diseases of sorghum, some of which frequently cause heavy losses, four general types may be recognized, viz, those reducing stands by rotting the seed or killing the seedlings, attacking the leaves and decreasing the forage value, attacking the heads and preventing normal grain formation, and those causing root or stalk rots and preventing normal development and maturity of the entire plant. These are described—with control measures where known. A final section deals with dust and liquid seed treatments.

Soybean disease investigations at the U. S. Regional Soybean Laboratory, W. B. ALLINGTON. (U. S. D. A.). (*Soybean Digest, 4 (1944), No. 11, pp. 60, 65*).—A brief résumé of recent studies.

New developments in soybean disease studies, B. KOEHLER. (Ill. Expt. Sta.). (*Soybean Digest, 4 (1944), No. 8, pp. 6–7, illus. 3*).—A brief summary of recent work in the State experiment stations and the U. S. Department of Agriculture.

A four year survey of sugar beet fields attacked by blackroot, M. W. SERGEANT (*New Agr., 26 (1944), Nos. 6, pp. 8–9; 7, pp. 8–9*).

Crop rotation and soil drainage effects on sugar beet tip rot and susceptibility of other crops to Aphanomyces cochlioides, W. F. BUCHHOLTZ. (Iowa Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 805–812, illus. 2*).—When grown in soil infested with *A. cochlioides,* the roots of corn, oats, soybeans, alfalfa, sweetclover, barley, and red clover remained uninfected; germination of flax appeared to be interrupted in one trial, but in the second test it was apparently not susceptible. On the other hand, the roots of sugar beets, pigweed, and lambsquarters became infected; the susceptibility of these two common weeds suggests the universal presence of *A. cochlioides* in the soils of northern Iowa. In fields with varying amounts of sugar beet tip rot the disease failed to develop in the first crop of beets on a given field; the third crop of beets in 8 yr. or less was severely tip-rotted, but there was no indication of severe sugar beet tip rot after alfalfa, even in one field where it had at one time previously occurred. Intervals of 3–4 yr. between beet crops should adequately avoid severe losses from tip rot, but an interval of 6 yr. or more—including 3–4 yr. in alfalfa—may be desirable for a field in which the disease has been severe. Tile drains were definitely associated with less than the field average of tip rot at Kanawha in 1938; the relationship between its severity and excessive soil moisture was indicated but not definitely established.

Serological studies on sugar-beet yellows virus, A. KLECZKOWSKI and M. A. WATSON (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 116–120*).—Specific antisera were prepared against sap expressed from beet plants infected with this virus. The antigen proved unstable; in the sap it was destroyed by holding for 2–3 days at room temperature or by heating for 10 min. at 52° C. It was unaffected by pH changes between 5 and 10. In detached leaves at room temperature it remained unchanged for at least 6 days, but the ability of aphids to transmit from such leaves fell off considerably in 4 days. The antigen was reversibly precipitated by $(NH_4)_2SO_4$ or sedimented by high-speed centrifugation. All attempts to isolate it from other sap constituents or to concentrate it have failed. The precipitin reaction proved of value in diagnosis and worked successfully with crude sap.

The use of abrasives for inoculating sugar-cane seedlings with the mosaic virus, D. C. BAIN. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 9, pp. 844–845*).—In the use of fine sand and carborundum as abrasives for inoculating 2-month-old seedlings of the cross Co. 281 × U. S. 1694 with mosaic virus, the basal part of unrolled leaves was rubbed with a mixture of inoculum and abrasive. The percentage of infection obtained was over three times greater than by the Matz method. Results were not consistent when plants of a susceptible variety of the same age grown from cuttings were employed.

Host-parasite relations in red rot of sugar cane, C. W. EDGERTON and F. CARVAJAL. (La. Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 827–837, illus. 6*).—This study indicated an internal lesion of red rot to consist typically of a white to straw-colored center surrounded by a red zone. In advance of the mycelium the protoplasm of the host cells becomes modified and a gummy material oozes out and fills the intercellular spaces; at the same time, a reddish dyelike substance is produced and absorbed by the cell walls. Mycelium advances but slowly into the red zone, which forms quickly in resistant and more slowly in susceptible varieties. In stalks where the cells are not functioning normally the mycelium spreads more readily than in standing cane. In both stalk and leaf the mycelium penetrates the cell walls through pits. Infection threads from appressoria were observed in epidermal cell walls of the leaf sheath. Acervuli develop from mycelium packed in the epidermal and subepidermal layers; this mycelium sends very small threads through the walls of the epidermal cells. The conidiophores and setae develop from these threads. The acervuli are subcuticular.

Life history of Cercospora on sweetclover, F. R. JONES. (U. S. D. A. coop. Wis. Expt. Sta.). (*Mycologia, 36 (1944), No. 5, pp. 518–525*).—The life history of *C. davisii* on *Melilotus* spp. has apparently been completed with the finding of the spermogonial and ascigerous stages. Development of the former seems to depend on temperatures below 20° C. The ascigerous stage—found on overwintered stems—is described as *Mycosphaerella davisii* n. sp. Evidence of resistance to stem blackening by this fungus is recorded.

A colorimetric method for the quantitative determination of minute amounts of tobacco-mosaic virus and for the differentiation between some of its strains, M. E. LOJKIN and H. P. BEALE (*Contrib. Boyce Thompson Inst., 13 (1944), No. 7, pp. 337–354, illus. 6*).—Quantitative microdeterminations of minute amounts of this virus were performed with the aid of a Klett-Summerson photoelectric colorimeter using the Folin phenol reagent, with the total weight of the virus required being 0.006 to about 0.600 mg. The relation between virus concentration and colorimetric scale readings cannot be expressed entirely satisfactorily by a single regression line—either arithmic or logarithmic—calculated for data covering the whole range of concentrations used. This relation can be best expressed for concentrations of about 0.008–0.060 mg. per cubic centimeter of reaction mixture by a logarithmic regression line calculated for this range and for concentrations below 0.008 mg. per cubic centimeter, either by a different logarithmic regression line or by an arithmic regression line fitting these lower concentrations. The photoelectric colorimeter can be calibrated by rapidly determining in duplicate the colorimetric readings of only a few solutions of known concentrations, plotting the results on logarithmic paper, drawing two straight lines, one for each of the two ranges of concentration, and using these two logarithmic straight lines as calibration lines. Thus the customary procedure of making calibration curves can be eliminated.

Tyrosine, tryptophan, and cysteine—the three amino acids generally considered responsible for the color developed by proteins with the Folin reagent—in the case of this virus contributed not more than one-third of the colorimetric value given by this protein with the phenol reagent in the presence of copper. In the absence of more than a trace of Cu ions the colorimetric values produced by this virus with the Folin reagent were much lower than the theoretical values calculated on the basis of the tyrosine, tryptophan, and cysteine content of the virus. The colorimetric values obtained for the ribgrass strain were higher than those of the type strain of tobacco mosaic virus. This difference was found to be statistically significant when the reaction was allowed to proceed in the presence of not more than mere traces of Cu ions; it was also significant when too large an excess of the Folin reagent was avoided. The colorimetric method is thus suitable for differentiating between two strains of tobacco mosaic virus one of which is known to differ from the other in its tyrosine and tryptophan content. There was no significant difference between the colorimetric values given with the Folin reagent by the type strain and four other strains of this virus not differing appreciably from the type in their tyrosine and tryptophan contents.

Tobacco disease control by crop rotation, E. E. CLAYTON, K. J. SHAW, T. E. SMITH, J. G. GAINES, and T. W. GRAHAM. (U. S. D. A., Ga. Coastal Plain, N. C., and S. C. Expt. Stas., et al.). (*Phytopathology, 34 (1944), No. 10, pp. 870–883, illus. 5*).—In these studies the degree of disease control from crop rotation varied considerably according to the year, the location, and the disease, as well as to the nature and length of the rotation. Bacterial wilt-infested land may be rotated with the utmost care and still have severe losses in occasional years or certain fields. Resistant crops were not necessarily superior to susceptible crops in reducing carry-over in the soil. Soil nematode populations were just as large after a crop of resistant corn as after one of susceptible tobacco, but root knot was consistently reduced by the use of immune crops. The occurrence of disease was generally related to the previous occurrence of host plants, though exceptions were important; there was as much stem rot in tobacco grown after stem rot-immune corn as in tobacco grown after stem rot-susceptible soybeans. It was not true that complete elimination of all plants favored the most rapid elimination of all soil-borne parasites; bacterial wilt infection survived better in the bare fallow plots than in those under crop plants.

Rotations affecting the carry-over of soil-borne disease have other important effects on crop yields: Those favorable from the nutritional standpoint may give high yields occasionally despite extensive disease development; bare fallowing reduces root knot nematode populations but also depresses yields. The figures for crop yield v. amount of disease are thus not always closely parallel, and rotations that are effective in disease control but reduce yields obviously have little value. Rotation is the only practical method available for combating many serious diseases, and the importance of developing rotation practices that definitely favor disease control is apparent. It is, however, impossible to generalize, for each disease presents its own special problem; since the results from rotation experiments show wide fluctuations, data from isolated tests may be quite misleading. Reliable conclusions can be drawn only from controlled experiments under a variety of conditions and over a number of years. Considering the field of disease control as a whole, it appears that such data are conspicuously lacking.

Lima bean seed treatment on Long Island, H. S. CUNNINGHAM. (N. Y. State Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 790–798, illus. 2*).—Spergon, Fermate, Arasan, Semesan Jr., copper oxychloride sulfate, Red Cuprocide, and Yellow Cuprocide were used on Long Island in seed treatment tests with lima beans. Under low soil moisture and rainfall after plating, the stand was improved regardless of temperature. With high soil moisture and low temperature, however, none of these materials gave sufficient protection to be of commercial value. Except in an unusually dry season the increase in stand from seed treatment was insufficient to influence yield. Treatment with Cu compounds hardened the seed coat and stunted the plants. In general, most of the fungicides improved the stands under conditions favorable to seed treatment, but in most cases any such improvement was so small that the yields were unaffected. On the basis of this work, seed treatment of lima beans cannot be recommended as a profitable practice for Long Island growers.

Investigations on the transmission of big vein of lettuce, R. C. THOMPSON, S. P. DOOLITTLE, and F. F. SMITH. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 10, pp. 900–904*).—The data presented show conclusively that the big vein disease is soil borne and that its causal agent can be inactivated by steam treatment of the soil. Under the experimental conditions, no recognizable symptoms appeared in leaves of any of the lettuce plants until they had grown in infected soil for at least 5 weeks, and a much longer time (up to 127 days) elapsed in some instances. Mechanical inoculations were made in roots, leaves, and stems of 136 plants, using methods that have proved effective in transmitting virus diseases in other hosts; although these inoculated lettuce plants were held for 50–60 days at temperatures favorable to big vein, no symptoms appeared. The experiments on insect transmission were not extensive enough to justify definite conclusions, but results indicate that a root aphid (*Pemphigus lactucae* (Fitch)) may be a vector.

Tomato seed treatment with New Improved Ceresan dust, B. H. Davis and C. M. Haenseler. (N. J. Expt. Stas.). (*Phytopathology, 34 (1944), No. 9, pp. 847–848*).—In attempts to find a substitute for New Improved Ceresan—now used in suspension for treating 70,000–80,000 lb. of tomato seed annually in New Jersey—none of the 37 possible substitutes tested (including Arasan, Spergon, and Fermate) proved wholly satisfactory. However, a simplified method, using New Improved Ceresan as a dust, gave definite promise. By this procedure a dosage of 0.5 percent by weight is used and the seed is agitated by hand for 5 min. or by a dusting machine; it has consistently given 98–100 percent clean seed in agar plate tests, thus meeting the Georgia plant certification requirements. This promising method not only gives as good seed protection as the liquid treatment but at the same time decreases the danger of chemical injury to workmen and eliminates the time-consuming and laborious dipping, centrifuging, and drying necessitated by the liquid treatment.

A method of producing an epiphytotic of tomato fruit rot in the field, W. A. Kreutzer and L. R. Bryant. (Colo. Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 845–847*).—To determine the effectiveness of certain fungicides in controlling *Phytophthora capsici* fruit rot and to test certain tomato varieties and types for resistance, a method for producing sufficient sporangia for large-scale field inoculations was needed. At satisfactory procedure was developed by growing isolates of the fungus in steamed barley for 60 days at room temperatures and mixing the resulting cultures with unsteamed field soil in a large wooden frame. By keeping this mixture moistened and aerated by turning it at 8–12-hr. intervals, sufficient sporangial inoculum was produced to inoculate field soil on an acre basis.

Infection phenomena in tomato-fruit rot caused by Phytophthora capsici, A. O. Simonds and W. A. Kreutzer. (Colo. Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 813–817, illus. 2*).—In histological studies of initial invasion, development of the fungus in the host and subsequent sporulation were investigated. Swarm spores were found to produce appressoria and invasion hyphae in 2–3 hr. at 25° C. after inoculation. Invasion hyphae grew directly into the epidermal cells, and after 48–72 hr. at 25° the accumulating hyphae ruptured the outer walls of the epidermal cells; sporangia were frequently produced in these external hyphal masses. Both laboratory and field studies revealed that fruit infection occurs more readily through the stylar than the stem end. Inoculation of stylar ends induced characteristic lesions in 20 hr., whereas only rust-colored arrested lesions were evident on the stem ends of fruits 6 days after inoculation. Examination of stem-end tissues of either inoculated or uninoculated fruits showed the presence of distinct crystal types and certain nonplastid globular masses. These bodies were not observed in stylar-end tissues. A correlation appeared to exist between the presence or absence of these structures and the resistance or susceptibility of the fruit tissues tested.

Relationship between environment factors in the development of curly top symptoms in the tomato, M. Shapovalov and H. L. Blood. (U. S. D. A. and Utah State Agr. Col.). (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20 (1941–42—1942–43), p. 18*).—An abstract.

Tomato leaf spot diseases in South Dakota, W. F. Buchholtz (*S. Dak. State Hort. Soc., Ann. Rpt., 41 (1944), pp. 107–111, illus. 2*).—Tomato leaf spots are reported to have caused low yields and poor quality of fruit in many eastern South Dakota gardens in 1942 and 1943; *Septoria* infection was more destructive than that by *Alternaria*. The two diseases and their control are briefly discussed, and a map shows the areas of the State undergoing severe, moderate, and light leaf spot defoliation, respectively.

Effect of different fungicides on leaf blight and yield of tomatoes, G. L. McNew (*Canner, 98 (1944), No. 22, pp. 14–18, 28, 30, illus. 2*).—Identical with Paper IX of the series previously noted (E. S. R., 89, p. 223).

La "quema" o "socarrina" de las hojas del olivo, producida por Stictis panizzei, De Not., en España [Olive leaf burn in Spain caused by the fungus S. panizzei], M. Benlloch (*[Spain] Bol. Inst. Nac. Invest. Agron. No. 10 (1944), pp. 309–318, illus. 11*).

Papel del calcio en la represión de la enfermedad conocida como "But Rot" o pudrición cogollo del cocotero [The role of calcium in controlling the disease known as butt rot or top rot of the cacao tree], O. P. Calzadilla (*Rev. Agr. [Cuba], 27 (1944), No. 26, pp. 143–149*).

Studies on the use of formaldehyde and sodium ortho-phenyl-phenate in the control of decay in citrus fruits, E. V. Miller, J. R. Winston, and G. A. Meckstroth. (U. S. D. A.). (*Citrus Indus., 25 (1944), No. 10, pp. 3, 15, 18*).—Sodium ortho-phenyl-phenate (Dowicide A) proved one of the most promising new chemicals tried for controlling decay in citrus fruits but was objectionable because of injury to the rinds; this difficulty was practically overcome by adding 1 part by weight of commercial formaldehyde (37 percent strength) to 4.5 parts of Dowicide A in aqueous solution, which can be made up as much as a month in advance. This mixture was used in both aqueous solutions and wax emulsions; it is deemed advisable to add it to the water used for diluting the wax rather than to the wax itself.

Lemon tree deterioration as related to psorosis virus, H. S. Fawcett (*Calif. Citrog., 29 (1944), No. 11, pp. 328–329*).—Though not causing the bark scaling on lemon as it does on orange, this virus throughout the tree may cause gradual deterioration; the crinkly leaf symptom on lemon is another deteriorating effect.

Wood discoloration in psorosis delayed by treatment, H. S. Fawcett and J. M. Wallace (*Calif. Citrog., 29 (1944), No. 12, pp. 364–365, illus. 1*).—In a 3-yr. test it was shown that 2.5 times as many new lesions formed on trees not treated as on those treated by the standard method of prevention.

The morphology and taxonomy of Alternaria citri, D. E. Bliss and H. S. Fawcett. (Calif. Citrus Expt. Sta.). (*Mycologia, 36 (1944), No. 5, pp. 469–502, illus. 5*).—Confusion regarding the morphological limits of this fungus has arisen because type specimens and illustrative material are lacking; new evidence on its morphology and taxonomy is here presented as based on a statistical study of spores and other characters of 26 isolates from fruits of Washington Navel orange, Deglet Noor date palm, and Holguin guava from various California localities, including some of the localities where Pierce obtained his original specimens. A method involving use of Czapek's agar is proposed as a standard laboratory technic for comparing isolates and identifying *A. citri*. The primitive nature of *A. citri* within the *Alternaria-Stemphylium* group is suggested by the morphological similarity between the spores and the mycelium. The principal differences between the authors' emended description of *A. citri* Ellis and Pierce and the original descriptions—as well as between their respective illustrations—may be attributed to the effects of the different substrates on the development of the fungus. The details of this monographic study are presented, and other species of fungi now considered by the authors to be similar to *A. citri* are listed with annotations.

A new species of Alternaria on fruit of Phoenix dactylifera, D. E. Bliss. (Calif. Citrus Expt. Sta.). (*Mycologia, 36 (1944), No. 5, pp. 538–549, illus. 3*).—*A. stemphylioides* n. sp., associated with spoilage of fruits of the date palm in California, is described. From the taxonomic standpoint it seems to occupy an intermediate position between the *A. citri* group of *Alternaria* and the *Pseudostemphylium* group of *Stemphylium*.

Disease of pan (Piper betle) in Sylhet, Assam.—I, The problem and its economic importance. II, Phytophthora foot-rot and leaf-rot. III, Effect of manuring on the incidence of Phytophthora foot-rot and leaf-rot diseases, S. Chowdhury (*Indian Acad. Sci. Proc., 19 (1944), No. 5, Sect. B, pp. 147–151, illus. 1; pp. 152–164, illus. 3; pp. 165–170*).—These contributions are mainly concerned with *P. parasitica* infection of betel pepper.

[Tung tree diseases] (*Amer. Tung Oil Assoc. Ann. Conv., Bogalusa, La., Papers, 9 (1943), pp. 24–29, 34–37, 50–53, 54–56*).—The following papers are included: Experiments on the Control of Thread Blight in Tung Orchards (pp. 24–29) and Root-Knot of Tung and Its Control (pp. 34–37), both by J. R. Large, and Potassium Deficiency of Tung, by M. Drosdoff, J. H. Painter, H. M. Sell, and S. G. Gilbert (pp. 50–53) (all U. S. D. A.); and Copper Deficiency of Tung, by M. Drosdoff and R. D. Dickey (pp. 54–56) (U. S. D. A. and Fla. Expt. Sta.).

Über den Fuchsien-Rost [Fuchsia rust], E. Gaumann (*Phytopathol. Ztschr., 14 (1942), No. 3, pp. 189–191*).—A note on rust diseases of *F. splendens* and related species and their alternate host plants.

Rhizome treatments for controlling Botrytis crown rot in iris, L. Dosdall. (Minn. Expt. Sta.). (*Phytopathology, 34 (1944), No. 9, pp. 772–789, illus. 5*).—In studies of the extent to which *Sclerotinia (Botrytis) convoluta* is carried on the rhizomes and whether it can be eliminated by rhizome treatment, 5,330 iris rhizomes of 14 varieties were treated in various ways over a 4-yr. period. Without outward signs of disease, rhizomes from an infested planting carried the pathogen to a varying degree depending on the season and apparently also the variety. With rhizomes from a heavily infested planting, no significant differences were found in the number carrying infection, whether from plants bearing conidia, sclerotia, or typical rot in the spring or from plants with no such disease signs. The disease is easily overlooked, and loss of plants may be attributed to winter injury. In 1 year's test it was much less severe with than without a straw covering. Rhizome treatments at transplanting effectively eliminated infection when clean soil was used. Various mercury treatments (Semesan, yellow oxide, $HgCl_2$, Hg_2Cl_2, acid mercury) were all effective. Some formalin treatments were as effective as acid mercury, but further trials are needed before recommending. Sulfur and $CuSO_4$ in the combinations used were unsatisfactory. All treatments tested were ineffective in heavily infested soil, although a Hg_2Cl_2 suspension stabilized with gum arabic gave some promise. Varieties responded differently to the same treatments.

A new rust of orchids, D. H. Linder (*Mycologia, 36 (1944), No. 5, pp. 464–468, illus. 8*).—*Sphenospora kevorkianii* n. sp.—causing considerable damage on *Epidendrum difforme* in Nicaragua—is described and illustrated.

A new Pseudonectria on Pachysandra, B. O. Dodge (*Mycologia, 36 (1944), No. 5, pp. 532–537, illus. 13*).—*Pseudonectria pachysandricola* n. sp.—a wound parasite causing canker blight of *Pachysandra terminalis* in the eastern United States—is described. The perithecia usually arise from stromata representing the basal remains of the *Volutella* stage (*V. pachysandricola*). The perithecial stage follows closely after the conidial stage, which is most in evidence during May-June, at least when moisture is plentiful. The connection between the two stages was established by culture and inoculation.

Some observations on heart rot in conifers from an ecological point of view, E. W. Fenton (*Forestry, 17 (1943), pp. 54–60*).—In survey work conducted in Scotland (1942–43), the moss *Leucobryum glaucum* was found to be correlated with the presence of heart rot in Scotch pine. Stagnant water or waterlogging of the soil increased the rot in conifers, but where the water was fresh and drainage satisfactory its incidence was low. When the grass *Holcus mollis* was locally dominant heart rot showed a definite increase; this was true to a lesser extent where *Agrostis tenuis* became plentiful. Dunging and grazing by sheep was followed by increased heart rot, and it would appear that certain grassy vegetation types, e.g., *Holcus* and *Agrostis,* approach an agricultural standard of fertility near that recognized as predisposing to heart rot in conifers planted on croplands. There was a slight increase where *Lastrea* ferns became locally dominant. The fact that healthy trees—often in the majority—occurred within the danger area suggested that there may be strains of conifers resistant to heart rot, and that these might be developed as a counter measure.

Chestnut breeding work in 1941, [1942, and 1943], A. H. Graves (*Brooklyn Bot. Gard. Rec., 31 (1942), No. 2, pp. 94–99, illus. 1; 32 (1943), No. 2, pp. 78–80; 33 (1944), No. 1, pp. 11–13*).—Further brief progress reports on the development of a tree suitable for timber and at the same time resistant to chestnut blight (E. S. R., 86, p. 803).

An experimental and histological study of phloem necrosis, a virus disease of American elm, D. M. McLean (*Ohio State Univ., Abs. Doctoral Diss., No. 43 (1943), pp. 93–98*).—The first symptom of this graft-transmitted disease was found to be the death of some of the fibrous roots; the yellow to brown discoloration of the phloem, following death of the roots and usually progressing into the stem, is associated with a faint odor of wintergreen on freshly cut tissues. The first observable symptom in the top is usually the loss of leaves. Typical symptoms have been observed in inoculated trees grown in a "complete" water-culture solution. Gross- and histo-pathological studies are summarized. From experimental results it is inferred that the virus does not move in the xylem; whether it follows tissues other than the phloem of American elm is uncertain. Attempts to graft patches of diseased American elm bark tissue to stems of the immune Siberian elm have been unsuccessful; it is suggested that these results may be due to the early killing of the scion by the virus. Tops of American elms grafted to root stocks of Siberian elm and inoculated had no disease symptoms 4 mo. after inoculation; sufficient time had not elapsed for final conclusions, but it is possible that this method may offer promise for controlling the disease. In the course of this study, typical symptoms have developed in 2–3-year-old American elm trees; experimental work may thus be carried on in the greenhouse during the winter season. It has also been shown that symptoms will develop above ground during the same season as inoculation following pruning or defoliation of inoculated trees.

Histo-pathologic changes in the phloem of American elm affected with the virus causing phloem necrosis, D. M. McLean. (Ohio State Univ.). (*Phytopathology, 34 (1944), No. 9, pp. 818–826, illus. 3*).—This virus was found readily transmitted by grafting diseased bark tissue to healthy suscepts; a natural vector has not yet been discovered. The fibrous roots die first after infection, necrosis progressing into the larger roots and finally—after death of the roots—the inner phloem of the lower part of the stem may be killed. Histopathological changes in the primary phloem of the root included hypertrophied cells and nuclei in the vicinity of mature sieve tubes, followed by hyperplasia and final crushing of the sieve-tube and companion cells of the older tissues. Hyperplasia and hypertrophy of parenchyma are the most striking microscopic symptoms in the phloem of older roots and stems. A yellow to brown discoloration of the phloem tissue accompanies death of the roots and usually progresses into the stem and lower branches before the tree dies. Associated with this discoloration is a faint odor of wintergreen in freshly cut tissues; this is not detectable in comparable healthy tissues. See preceding abstract.

Biochemistry of the wood-rotting fungi.—IV, Metabolic products of Trametes suaveolens (Linn.) Fr., J. H. Birkinshaw, A. Bracken, and W. P. K. Findlay (*Biochem. Jour., 38 (1944), No. 2, pp. 131–132*).—In continuation of the series (E. S. R., 83, p. 362),[1] the authors examined the volatile products of this fungus, identifying methyl anisate as the major product with anisaldehyde also detected in much smaller amount. These products are believed to be the two chief contributors to the odor of the fungus in culture. A little free anisic acid was also detected, possibly arising by atmospheric oxidation of the anisaldehyde.

The fungistatic powers of Penicillium notatum, L. O. Overholts. (Pa. Expt. Sta.). (*Pa. Acad. Sci. Proc., 18 (1944), pp. 32–39, illus. 14*).—In growing the fungi of timber decay in culture it soon became evident that it is extremely difficult or impossible to get them to fruit and hence to identify them. The antagonistic effects of one fungus on another gave promise to aid in this respect, as by growing these decay fungi each against the same species such a variety of specific reactions resulted as to aid in the problem of specific identity. The author believes it possible to identify any decay fungus if it can be grown against a large enough series of what he calls "reactor species." To this end, he has used various fungi. Many Ascomycetes and some Fungi Imperfecti have proved good reactors; many Phycomycetes, on the other hand, have the overrunning habit and are less desirable. The author here presents some experimental results with *P. notatum,* listing 9 species found rather definitely antagonistic, 10 with a degree of antagonism finally allowing contact but not overgrowth, and 10 allowing overgrowth of the *Penicillium.* Of these 29 species, all but 3 are wood-inhabiting. Though the list involved is probably not large enough for sweeping conclusions, it would appear that *P. notatum* is not a strong enough antibiotic as far as these fungi are concerned; Phycomycetes, Ascomycetes, and Fungi Imperfecti, as well as Basidiomycetes, occurred in each of the three reaction groups, but here again the numbers are insufficient to warrant conclusions. What the inhibiting substance here may be is unknown; it may or may not be penicillin or notatin.

Host-parasite relationships of the root-knot nematode, Heterodera marioni.—I, The question of races, J. R. Christie and F. E. Albin. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 11 (1944), No. 1, pp. 31–37*).—Various investigators have presented evidence that races of this parasite exist and may be of considerable inmportance in control procedures, especially those involving resistant plants. Recent studies by the authors corroborate these conclusions and indicate that differences in host-parasite relationships of different races may manifest themselves in at least two ways: (1) A plant may be susceptible to one race and resistant to another or (2) it may be susceptible to each of two races, but the type of root galling produced by one race may differ from that due to another. The two experiments here reported—using 9 and 14 populations, respectively—are considered merely exploratory in nature. The results of the first test indicated that Persian clover (*Trifolium resupinatum*) is not an equally suitable host for all the populations tested, suggesting that races differing from one another in host-parasite relationships must have been included. In the other test, comparing the susceptibility of some eight varieties or species of plants to the various nematode populations, the most striking difference was shown by peanut, cotton, and alfalfa; though tomato was susceptible to all populations the type of galling differed markedly among them. The net results of this test indicated that these 14 populations included at least 5 distinct races and probably more. Peanuts have been considered highly resistant to root knot; in these tests the Virginia Runner variety proved highly resistant to all the races except one—to which it was susceptible; the last was not the race causing "big root" of tobacco. Hence to control root knot in tobacco there is reason to believe that peanuts can be recommended in the rotation; on the other hand, if the purpose is to control root knot on potatoes or parsnips and similar root crops, inclusion of peanuts is open to question. These statements are based on tentative conclusions that need verification; they are presented to illustrate how recognition of the fact that there are distinct races of this nematode may aid in formulating more intelligent procedures when fuller information becomes available.

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[1] Biochem. Jour., 34 (1940), No. 6, pp. 906–916; 36 (1942), No. 5–6, pp. 526–529.

Nacobbus dorsalis, nov. gen. nov. spec. (Nematoda: Tylenchidae) producing galls on the roots of alfileria, Erodium cicutarium (L.) L'Hér., G. THORNE and M. W. ALLEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc., 11 (1944), No. 1, pp. 27–31, illus. 1*).—Roots of this plant—commonly known as "filaree"—collected in California (1943) bore galls closely resembling root knot; microscopical examination showed the causal agent to be the entirely different nematode which is here described. Filaree is frequently one of the most favorable plants to examine in making surveys for root knot in certain of the interior valleys of California, and the finding of *N. dorsalis* immediately complicates the problem of identification, especially in the field. Since there is also the possibility of other plants being attacked, microscopic examination of all root galls will be necessary until the hosts and distribution of the new species have been determined.

ECONOMIC ZOOLOGY—ENTOMOLOGY

What can forest wildlife contribute to the war program? N. W. HOSLEY ET AL. (*Jour. Forestry, 42 (1944), No. 5, pp. 361–363*).—This is a report from the Committee on Game Management With Reference to Forestry, American Society of Foresters, the conclusion being that under proper management forest wildlife could contribute much more to the war program in the form of meat, fish, furs, fats, skins, and recreation than it is now doing. Frequently this contribution could be made to the advantage of the wildlife itself through the removal of surplus populations. "Some way must be found, both in war and in peace, to harvest the allowable crop and at the same time to retain public support of conservation measures."

Survival and growth of shrubs planted for wildlife in New York, D. B. COOK and F. C. EDMINSTER. (U. S. D. A. et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 185–191, illus. 3*).—In 1941, cooperative field tests were made of 13 species of hardwood trees and shrubs at the eastern edge of the Allegheny Plateau in New York State. Of the three site treatments used, plowing gave the best growth and highest survival, whereas scalping proved only slightly better than slit planting in undisturbed sod. Standard grade stock showed definite and consistent superiority over culls. The extra cost of plowing was more than offset by the greater ease of planting and better growth and survival. At the end of the third growing season the most promising species were arrowwood, multiflora rose, early shrub lespedeza, silky dogwood, black chokeberry, and bayberry.

Deciduous forest man and the grassland fauna, [I], II, V. E. SHELFORD. (Univ. Ill.). (*Science, 100 (1944), Nos. 2590, pp. 135–140, illus. 2; 2591, pp. 160–162*).—The main objective of this discussion is to point out the interactions of the four elements involved in exploitation of the North American grasslands, viz, the biotic community animals, the plants, the habitat, and the settlers. This involves a discussion of the original character of the native animals and their interactions or coactions with each other and with plants; the general character of the plains habitat and its plant community; and certain physiological and psychological characteristics of the white settlers, together with their customs, cultural background, and industrial prejudices. In this review of the history of the Great Plains grassland, the author takes up the qualities of the settlers in general, followed by a discussion of the trapper, the trader, the cattleman, and the plow farmer.

The value and practicability of wildlife censuses along highways, H. R. Siegler and C. C. Newman (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 93–99, illus. 1*).—It is concluded from this study that counts of mourning doves during only 2 yr. will not reveal relative population densities from one season of the year to the next, but that they do provide general impressions as to the relative abundance between two major plant zones. Highway mortality counts do not indicate the relative abundance, relative vulnerability to traffic, or relative mobility of one animal species as compared with another. Such counts are of little value in life history studies, but carcasses of animals dead on roads afford some kinds of information. Highway mortality counts are of minor value for studying the distribution of species and lateral movement, population densities, and animal behavior. Because of the many variables encountered, it is generally difficult or impossible to ascertain reasons for the rise and fall of mortality of species on highways, or to discover practical remedies for decreasing such mortality. Such counts are of definite value, however, in isolated instances of large local mortality, where the cause is readily apparent and remediable. These counts, over a period of years, are helpful in tracing extensions of range by some species. There are 34 references.

What deer eat, by species, by season, by range, and by preference, A. H. Carhart (*Amer. Forests, 50 (1944), No. 8, pp. 383–385, illus. 3*).

October 1943 survey of loss of cranberries as a result of deer damage, D. O. Boster. (U. S. D. A.). (*Amer. Cranberry Growers' Assoc., Proc. Ann. Mtg., 74 (1944), pp. 12–13, 16–17*).—Analysis of the returns from a questionnaire to growers of New Jersey gave an average of 8.1 percent loss of the crop from damage by deer.

Brood nests and young of two western chipmunks in the Olympic Mountains of Washington, W. T. Shaw (*Jour. Mammal., 25 (1944), No. 3, pp. 274–284, illus. 5*).

Color, sex ratios, and weights of Maryland muskrats, II, H. L. Dozier (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 165–169, illus. 1*).—Details on the color, sex ratios, and weights of 9,895 muskrats obtained in 1941 and a review of the literature on the subject have been previously published; the present study is a report on the 1942 trapping season, when 6,735 muskrats were taken in the same areas—32 percent below that of the preceding year and representing a downward trend from the peak population of 1938.

Distribution and variation in pocket gophers (Thomomys talpoides) in the State of Washington, [I], II, W. W. Dalquest and V. B. Scheffer. (Univ. Calif. et al.). (*Amer. Nat., 78 (1944), Nos. 777, pp. 308–333, illus. 4; 778, pp. 423–450, illus. 4*).—In part 1 of this monographic study the authors consider the immigrational history of the pocket gophers of Washington and their habits with relation to speciation and—for the Puget Sound area—take up the problems of variation in races, description of the prairies inhabited by them, variations in size and color, and qualitative differences. In part 2 they discuss the criteria used in classifying the gophers of the State and present an annotated catalog of races and detailed data on the 17 subspecies of *T. talpoides* found to occur there. There are 18 references.

Growth, development, and seasonal weights of spotted skunks, D. D. Crabb. (Iowa Expt. Sta. et al.). (*Jour. Mammal., 25 (1944), No. 3, pp. 213–221, illus. 2*). —These data were accumulated during an investigation of the ecology and management of the prairie spotted skunk *Spilogale interrupta* during 1939–42, when juveniles were handled each summer and fall. Most of them were caught in box traps after they began to forage for food, but a few were handled before or soon after their eyes were open; one litter was reared in captivity each summer.

Douglas ground squirrel as a predator on nests of upland game birds in Oregon, F. W. STANTON. (Oreg. State Col. et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 153–161*).—In Oregon, the Douglas ground squirrel (*Citellus beecheyi douglasii*) was found to eat eggs of the pheasant and bobwhite quail and thus to be a definite factor in nesting losses of these game birds. The squirrels were active throughout the nesting season and found a large percentage of the nests. They may eat the eggs at the nest, but more regularly they carry off single eggs and evidently make repeated return visits. Both observations and feeding tests show that only certain individual squirrels eat eggs—apparently an acquired taste; at other times a known "egg eater" will ignore eggs. Nest raiding was not proved to be greatest in any one month. Nests in proximity to squirrel burrows were particularly susceptible to destruction. The degree of predation was not influenced by the naturalness of the habitat for game birds, nor did the size of the clutch appear to be a factor in the probability of its discovery. Nests in weeds or brush were less likely to be destroyed than those in grass or cultivated crop cover.

The wood rat as an ecological factor in southern California watersheds, J. S. HORTON and J. T. WRIGHT. (U. S. D. A.). (*Ecology, 25 (1944), No. 3, pp. 341–351, illus. 2*).—This rat (*Neotoma fuscipes macrotis*) is one of the most abundant and typical rodents of the chaparral formation of the San Gabriel Mountains of southern California, its population throughout the watersheds studied averaging 4.6 individuals per acre. Each rat occupied a large nest of branches and twigs, with living and food-storage compartments. At altitudes below 4,500 ft. leaves and twigs of *Quercus dumosa* furnished most of the food throughout the year, leafage of many other chaparral species also being used. The typically small quantity of food stored at these altitudes was less in summer than in winter. Above 4,500 ft. the storage of acorns in the fall was conspicuous. Snows at this altitude required a large amount of material for winter use, including besides acorns much leaf material of *Quercus,* etc. The activities of this rodent exert no appreciable influence on the vegetation cover of the chaparral watershed, with the possible exception of the heavy use of acorns at the higher altitudes.

The giant kangaroo rat and sheep forage, A. C. HAWDECKER (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 161–165, illus. 1*).—The giant kangaroo rat (*Dipodomys ingens*) and the San Joaquin antelope squirrel (*Citellus nelsoni*) were found to occupy the same territory but not to compete; the former is abroad at night, the latter during the day. The cultivating action of the kangaroo rat increased the amount of the red-stemmed filaree and red bromegrass more than five times, thus creating more sheep feed where greatly needed. The portions of land thus cultivated also remained green longer in the season.

Notes on a heavy Norway rat population, H. GUNDERSON. (Iowa State Col.). (*Jour. Mammal., 25 (1944), No. 3, pp. 307–308*).

Rat-trapping records show effectiveness of control methods, R. E. DOTY (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.] 48 (1944), No. 2, pp. 73–82, illus. 4*).—Before this study (1938–44) of the effects of systematic prebaiting and poisoning was inaugurated, the field rat population of the Kauai Variety Station averaged a catch of 6.8 rats per 100 traps per day (April-August 1938). The corresponding months of the following years under the prebaiting system of control indicated the attainment and maintenance of a very satisfactory reduction in population. No appreciable rat damage to sugarcane has been encountered since prebaiting and poisoning by the feeding-station method was inaugurated. A study of seasonal fluctuations in rat population in canefields under prebaiting showed that the amount of reinfestation from outside areas begins to rise in October, reaches a peak in December-January, and declines to April of the following year; from April to July migration to cane lands was at the lowest ebb of the year. Investigation of the change in rat population with elapsed time following a prebaiting and poisoning round indicated that no significant or damaging increase occurred during the interval (average 3.5 mo.) between poisoning rounds. The usual seasonal variation in migration to cane land from outside areas was greater than this increase due to the length of time between poisonings.

Red squill, L. R. PARKINSON. (Mass. Expt. Sta.). (*Soap and Sanit. Chem., 20 (1944), No. 6, pp. 123, 125, 153, illus. 2*).—A general account, including botanical description, chemistry, effects on rats, traditional methods and modern advances in preparation, modern commercial preparations, and the present situation.

Weights and temperatures of some Michigan birds, G. B. BECKER and J. W. STACK. (Mich. Expt. Sta.). (*Bird-Banding, 15 (1944), No. 2, pp. 45–68*).—As a result of studies begun in 1931 under exceptional opportunities for collecting such data, decided variations were found in bird weights and temperatures and a slight indication that larger birds have a lower average body temperature than the smaller species. The factors responsible for these variations have not yet been determined. Repeater weights averaged lower and their temperatures higher than the average sample of the whole species. The slate-colored junco and the white-throated sparrow showed a gain in weight in spring over the preceding fall; the Mississippi song sparrow retained about the same weight in both fall and spring. No seasonal effect on temperature variation was found.

The birds of Simcoe County, Ontario, I, O. E. DEVITT (*Roy. Canad. Inst. Trans., 24 (1943), pt. 2, pp. 241–314, illus. 1*).—In bringing together this account consideration has been given not only to scientific data but also to the region's wealth of early natural history records. Introductory sections deal with a description of the area covered, including its topography, forests, and climate, a summary of historical and recent ornithology in the county, life zones and faunal areas, modern changes in bird life, and migration. Following this is a copiously annotated list of 125 birds.

Food of hawks and owls in Maine, H. L. MENDALL (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 198–208*).—The studies discussed constitute additional evidence that local investigations are needed before a hawk or owl is condemned simply because it is a bird of prey. It would appear that only three of the species studied exhibited strong detrimental tendencies—the goshawk and great horned owl as destroyers of poultry and game and the sharp-shinned hawk as an important predator of song birds. Lists are given of species distinctly beneficial, usually beneficial, neutral, and primarily detrimental. Control, even of detrimental species, should be left to persons who know exactly what and why they are controlling.

Winter foods of the ruffed grouse in Ohio, M. C. GILFILLAN and H. BEZDEK (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 208–210*).—This report is based on the crop and gizzard contents of 26 ruffed grouse collected during November 1939 in the beech-maple climax forests of northeastern Ohio and the digestive tracts of 16 specimens taken during November-March 1942–43 in the oak-hickory forests of southeastern Ohio.

Food preferences of mallards on the Chippewa National Forest, Minnesota, J. E. STOUDT (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 100–112, illus. 1*).—A general investigation in this area (1936–40), including censuses, cover utilization and nesting of the breeding ducks, their preferences as to autumn feeding grounds, and inventories of ducks shot by hunters, had shown where the birds were most abundant in summer and fall. For effective management, however, it was necessary to determine why the ducks preferred certain areas for nesting and for feeding. This study—begun in 1940 and here reported upon in detail—seems to bear out the viewpoint that wild rice is the food of greatest preference; when feeding on rice is discouraged by commercial ricing or hunting pressure other foods may be eaten readily, but rice, when available, is the main choice in the fall. Another emphatic conclusion is that hunting pressure is always heaviest on the better feeding areas because the ducks concentrate thereon for some time previous to the opening day. Consequently, after the first day or two, the volume of use of any duck food in a particular region is inversely proportional to the hunting pressure on the water areas where that food is available, rather than being proportional to the abundance of the food itself. An analysis of duck foods taken from ducks during the hunting season merely reflects the availability of these foods as determined by hunting pressure and not necessarily by the preferences of the ducks themselves. When such pressure is too great, or too early or too late in the day, the ducks may shun the rice beds entirely and resort to feeding on the areas of open water or in pot holes where pondweeds, burreeds, sedges, and grasses are the only foods available. Rice in the Chippewa National Forest, however, is definitely the main factor in determining whether or not a big flight of mallards will spend part of the autumn season in this area.

Mourning dove management, H. E. McClure (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 129–134*).—This is a general discussion of the mourning dove (*Zenaidura macroura*) as a game bird, with suggestions as to its management on a national and international scale since it breeds from southern Canada to northern Mexico and migrates throughout North America from Alaska to San Salvador. There should be no hunting north of the 37th parallel, all of the area north of this boundary being left as a vast breeding range to maintain the species and supply a shootable surplus, according to the sevenfold reasons enumerated.

Dispersal and survival of game farm bobwhite quail in northcentral Oklahoma, F. M. Baumgartner. (Okla. A. and M. Col.). (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 112–118, illus. 1*).—A field study on 1,064 game farm bobwhite released on an area in north-central Oklahoma yielded the following: Under unfavorable conditions, such as poor range or a surplus of wild birds, neither adults nor young established themselves; under favorable environment, both adults and young tended to take up ranges within a mile of liberation, though a few dispersed rapidly and moved 2–8 miles during a few days to several months. Adults liberated in summer and fall were apparently unable to cope successfully with conditions in the wild and did not provide stock for either hunting or breeding. When environal conditions were very favorable, it was estimated that as many as 50 percent of the young furnished hunting in the late fall and 45 percent were available as breeding stock in the spring. Survival of birds moving off the stocked areas appeared to be so limited that they did not materially supplement the wild populations. Heavy restocking with game farm birds thus appears to be costly and a rather futile method of increasing bobwhite populations for either hunting or breeding stock.

Wartime diet for growing bobwhite quail, R. B. Nestler, L. M. Llewellyn, and M. Benner (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 211–218, illus. 5*).—A diet containing 14 percent sardine fish meal was formulated in 1941 which gave satisfactory results in survival and growth; fish now being scarce, search was made for a diet omitting war-restricted materials. In a comparison of 10 diets, quail fed the above formula modified by substituting 0.12 percent D-activated sterol for vitamin A and D feeding oil fortified showed the highest survival and best live weights at the end of the sixth and tenth weeks and were among the top three groups in requiring the least amount of feed per unit of gain in weight, but they consumed the greatest quantity of feed. Other diets are compared. When D-activated animal sterol was used as a source of vitamin D and yellow corn and a good grade of alfalfa meal as sources of vitamin A, fish oils were omitted from the diets without causing symptoms of avitaminosis. Because of the instability of vitamin A in storage, however, it is advisable to include sufficient fish oil to supply at least 2,000 International Units of vitamin A per pound of feed on a total feed basis.

Winter protein requirements of bobwhite quail, R. B. NESTLER, W. W. BAILEY, L. M. LLEWELLYN, and M. J. RENSBERGER (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 218–222*).—As a result of experiments on 714 bobwhite quail during the winters of 1939–41, it was found that considering survival, live weights, feed consumption, and subsequent reproduction by the birds the 9–13-percent levels of crude dietary protein gave as good results as higher levels and in some respects they were even better. It is recommended that the winter maintenance diet contain about 11–12 percent crude protein.

Managing the waterfowl, I. N. GABRIELSON (*Pa. Game News, 15 (1944), No. 5, pp. 2–5, 21, illus. 8*).—An address discussing the basic concept on which national and international waterfowl regulations have been made.

Parasitism by Protocalliphora and management of cavity-nesting birds, E. A. MASON (*Jour. Wildlife Mangt., 8 (1944), No. 3, pp. 232–247, illus. 3*).—During 1936–41, 162 broods of cavity-nesting birds and nests of other species were examined at Groton, Mass., for the nest parasite *P. splendida*. Observations were also made on the occurrence of the secondary parasite *Mormoniella vitripennis*, and information was obtained on the life histories of both insects. Details of the investigation are given. *Mormoniella* has other dipterous hosts, instances of its parasitizing sarcophagid flies being found. These may be preferred to *Protocalliphora* as hosts. Ground clove and naphthalene (moth balls) proved unsatisfactory as repellents of *Protocalliphora*, nor did painting nest boxes blue deter the parasites. The best management practice is said to be delayed cleaning of the nest cavities until spring or early summer to safeguard brood stock of the secondary parasite.

The blood protozoa of North American birds, C. H. HERMAN (*Bird-Banding, 15 (1944), No. 3, pp. 89–112*).—A list is presented of the blood protozoa of birds systematically arranged both by parasites and by hosts, with 103 bibliographic references and with accompanying introductory discussion.

Twenty-four hour periodicities in the animal kingdom.—I, The invertebrates, J. B. CALHOUN (*Jour. Tenn. Acad. Sci., 19 (1944), Nos. 2, pp. 179–200; 3, pp. 252–262*).—In recent years there has been an increasing awareness that many animals are so adjusted to changes in environal conditions from day to night as to be better adapted to conduct certain activities in one part of the 24 hr. than in another. By becoming adapted morphologically and physiologically to a limited portion of the 24-hr. cycle an animal is better able to meet the contingencies of its habitat niche. This trend in specialization has allowed animals to be classified into the two large groups, diurnal and nocturnal; another rhythmic group includes those whose activities are confined to the dawn or dusk periods; there is also the group which may be active at any time. Research on this phenomenon of 24-hr. periodicity among animals has been conducted by physiologists, ecologists, and psychologists with very scant unification of effort; it is the purpose of this review (4 pages of references) to bring together some of the literature. Part 1 considers the Protozoa, Coelenterata and Ctenophora, Platyhelminthes, Nemathelminthes, Annelida, Echinodermata, Mollusca, and Arthropoda (including the diplopods, arachnids, crustaceans, and insects).

Discussion on slugs, I, II (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 160–163, illus. 3; pp. 163–164*).—The following are included:

I. ***Introduction: Seasonal activity of slugs,*** H. F. BARNES.—By use of the method described—the reliability of which is believed established—the seasonal activity of the five commonest garden slugs was studied in about 50 gardens over a 2-yr. period. *Arion subfuscus* was the first to reach its maximum numbers during what is usually warm and dry weather. *Agriolimax reticulatus (agrestis)* came next, followed quickly by *Milax sowerbyi*. *M. gracilis* and *Arion hortensis* failed to reach their peaks until the weather became prevailingly wet and cold.

II. *Field sampling for slugs,* D. C. THOMAS.—A brief report on tests with metaldehyde–bran and paris green–bran baits in estimating populations of slugs and their injuries to crops.

Aphanomyces as a fish parasite, L. SHANOR and H. B. SASLOW. (Univ. Ill.). (*Mycologia, 36* (*1944*), *No. 4, pp. 413–415, illus. 1*).—On *Aphanomyces* sp., causing a serious outbreak in fish aquaria.

The utilization of metabolic water in insects, G. FRAENKEL and M. BLEWETT (*Bul. Ent. Res., 35* (*1944*), *No. 2, pp. 127–139*).—The length of larval period, water content of food and of freshly formed pupae, and the wet and dry weights of pupae and of food consumed during larval development were determined for the confused flour beetle, the Mediterranean flour moth, and the hide beetle grown at several humidities. The "net utilization" of the food was calculated as the ratio of dry weight of food eaten to dry weight of pupa. At low humidities more food was eaten to produce a given unit of body weight, since part of it was utilized as water; consequently, the larvae grew more slowly and their final size and that of the pupae was smaller. It is shown for the hide beetle at 30 percent and the Mediterranean flour moth at 1 percent relative humidity that less than 32.9 and 7.6 percent, respectively, of the water in the pupae can be derived from water ingested with the food.

In a supplementary test with the Mediterranean flour moth, at 70 percent r. h. the water contents from early prepupa to pupation remained essentially the same; at 20 percent, the water content of the early prepupa was somewhat lower. The late prepupa and pupa at 20 percent r. h. had about the same water content as all stages at 70 percent. The water rose from early to late prepupa from 63.7 to 66.8—a statistically significant difference. The percenatge loss in dry weight from the early to the late prepupa, or the pupa, was about a fifth higher at 20 than at 70 percent r. h. The slight rise in water content between early and late prepupa may be therefore attributed to increase in the oxidation of dry substance, an increase which, however, clearly is not due to increased rate of respiration but to the lengthening of the prepupal period by about 20 percent. In addition, before pupation the larva spins a cocoon, and it may reasonably be assumed that inside the humidity will be considerably higher than outside, especially at low humidities. How far this will account for the rise in water content during the prepupal period cannot be stated with certainty. In some cases where the cocoon consisted of only a few threads, apparently allowing free circulation of air, the water contents of prepupae and pupae were not lower than of those living in dense cocoons.

Stages in the recognition of biotin as a growth factor for insects, G. FRAENKEL and M. BLEWETT (*Roy. Ent. Soc. London Proc., Ser. A, 19* (*1944*), *No. 1–3, pp. 30–3*[illegible] *illus. 2*).—Insects bred on an artificial diet of casein, glucose, cholesterol, salts, and aqueous yeast extract required in addition for optimum growth the water-insoluble residue of yeast. This "insoluble factor" is not fat-soluble and becomes soluble on autolysis or autoclaving. Experiments described led to its recognition as biotin.

Intracellular symbiosis and vitamin requirements of two insects, Lasioderma serricorne and Sitodrepa panicea, M. BLEWETT and G. FRAENKEL (*Roy. Soc.* [*London*], *Proc., Ser. B, 132* (*1944*), *No. 867, pp. 212–221, illus. 4*).—Normal larvae of the cigarette beetle and the drug store weevil and larvae freed from their intracellular symbionts were grown on various diets. On white flour deficient in B-group vitamins, normal larvae grew very much better than sterilized larvae, whereas no such difference in the growth rate occurred on a diet rich in vitamins of the B group, e. g., whole-wheat flour plus yeast. On an artificial diet containing the vitamins of the B complex as pure substances, the normal *Lasioderma* larva grew well or fairly so in the absence of either thiamine, riboflavin, niacin, pyridoxine, or pantothenic acid and the *Sitodrepa* larva in the absence of any of these five vitamins. It is concluded that the intracellular symbionts of these two beetles supply the vitamins of the B group.

Insect food habit ratios of New York State, H. B. Weiss (*Jour. N. Y. Ent. Soc., 52 (1944), No. 3, pp. 283–284*).—The author has classified according to their family food habits 15,343 of the species previously recorded from New York (E. S. R., 58, p. 754). A table shows the distribution ratios of food habit types for New York, and for comparative purposes the ratios for five other large areas are included.

Insect response to colors, H. B. Weiss (*Jour. N. Y. Ent. Soc., 52 (1944), No. 3, pp. 267–271*).—The author calls attention to the approximately similar qualitative results obtained by various workers who used widely different methods of approach and technic in studying the behavior of insects to different wavelengths of light; he concludes from this review that both the electrical responses of the insect eye and the motor responses of the insect itself to different colors of equal intensity are due to differences in sensitivity, or to the absorption of light—which varies with wavelength—by the primary photosensitive substance of the visual sense cells, and are not the effects of wavelength by itself.

The thirteenth or 1943 annual insect population summary of Kansas, R. C. Smith and E. G. Kelly. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 3, pp. 81–98, illus. 1*).—This includes summaries for 1943 of crop production and of weather conditions in the State by months and a descriptive account of the more important insect activities and climatic relationships during the year. See also a previous note (E. S. R., 89, p. 562).

A survey of insect pests of New Caledonia, F. X. Williams (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.], 48 (1944), No. 2, pp. 93–124, illus. 37*).—A brief discussion of New Caledonia and its natural history is given, followed by notes on many insects, related organisms, and other animals which are pests or potential pests of the island. Numerous photographs and several drawings supplement the text. Pests of each specific crop are grouped together.

Plagas del algodón su control en la región de Matamoros, Tamps. [Insect pests of cotton and their control in the Matamoros region, State of Tamaulipas, Mexico], I. Moreno G. (*Fitófilo, 2 (1943), No. 6, pp. 70–94; 3 (1944), No. 1, pp. 87–97*).

The wheat insect situation as determined by the survey of 1944, T. H. Parks (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 235–237, illus. 1*).—Ohio hessian fly infestation for 1944 by counties and average State infestation for the past 27 yr. are noted; mention is made of other wheat insects, including wheat midge, wheat jointworm, black wheat-stem sawfly, and chinch bugs, as well as a brief discussion on the control of wheat insects.

New descriptions of larvae of forest insects.—VIII, Larvae of the genus Melanolophia (Lepidoptera: Geometridae), W. C. McGuffin (*Canad. Ent., 76 (1944), No. 6, pp. 124–126, illus. 2*).—Three species, with key, are included in this installment (E. S. R., 90, p. 508).

Inert dust insecticides, I–III, P. Alexander, J. A. Kitchener, and H. V. A. Briscoe (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 143–149, illus. 2; pp. 150–156; pp. 156–159, illus. 1*).

I. *Mechanism of action.*—The mode of action of inert dust insecticides on the granary weevil was studied by determining mortality-time curves and by detailed investigation of the effect of dusts on the water relations of insects. Dusts were found not to depend for their action on any chemical reactivity, some highly inert substances such as diamond and carborundum proving very effective; a physical process is therefore indicated. Dusts do not penetrate into the respiratory system, and though large amounts are ingested they seem to have little harmful effect. Effective dusts increased the evaporation rate of water from insects to the air, and the relative killing powers of different dusts ran parallel with their capacities for promoting evaporation. These results harmonize with the view that inert dusts induce death of insects by desiccation.

II. *The nature of effective dusts.*—As to the conditions required for an inert dust to become effective, particle size and intrinsic hardness proved to be important though not the only factors in killing the granary weevil. For carborundum, particles larger than 15μ were without action, probably because they failed to adhere to the insects; the effectiveness increased as the size was reduced from 10μ to about 2μ, where a maximum was reached. The action of a large number of substances was tested by a simple method which eliminated complications from particle size differences; results exhibited a correlation of efficacy with hardness. In general, materials softer than calcite proved ineffective; their efficacy increased with hardness, but the method of preparation was also important. Some dry-ground powders were inferior to those wet-ground, a result apparently due to some kind of surface change —possibly the formation of a Beilby polish layer. The action of some dusts was also considerably altered by superficial chemical treatment. A theory is proposed—based on an experiment with an artificial membrane system—to explain the mechanism by which dusts promote evaporation of water from insects. It is suggested that clean crystalline surfaces of effective dusts can absorb, or in some way penetrate, the water-resistant epicuticle.

III. *The effect of dusts on stored products pests other than Calandra granaria.*—The inert dusts used in the preceding studies against the granary weevil were also found effective in vitro against a variety of other insects—both larvae and adults—infesting stored products. Both the order and the magnitude of effectiveness of a series of dusts differed among the insect species, but the mechanism of action appeared to be the same, viz, promotion of evaporation of moisture, leading to death by desiccation. In contrast to the results with the granary weevil, highly adsorbent dusts like charcoal were much more effective on larvae than were mineral powders. Dusts had a particularly striking action on the yellow mealworm, which was therefore more fully investigated; dead mealworms when dusted failed to lose water nearly as rapidly as live dusted ones.

The mechanism of action of a contact insecticide, D. N. Roy and S. M. Ghosh (*Bul. Ent. Res., 35 (1944), No. 2, pp. 161–170, illus. 3*).—These studies indicated that rapid penetration of an insecticide into the insect body cannot be effected through the cuticle. When a mosquito has been sprayed with a mixture of pyrethrum extract and oleic acid the deposition of fat globules around the tracheal trunks is a characteristic feature, suggesting that rapid diffusion of the insecticide takes place through the tracheal wall. Experiments on flies with their spiracles closed showed that the absorption of pyrethrum—either in liquid or powdered states—is very slow, indicating that pyrethrum normally enters the body through the spiracles.

Insecticide diluents: Solubility of arsenicals and copper fungicides as affected by diluents in agricultural dusts, M. W. Goodwin, S. L. Hopperstead, and K. J. Kadow. (Del. Expt. Sta.). (*Soap and Sanit. Chem., 20 (1944), No. 8, pp. 103, 105, 107, illus. 2*).—Dust mixtures were prepared with and without calcium arsenate using different diluents, each with red cuprous oxide, tribasic copper sulfate, and copper oxychloride. A good correlation existed between pH and water-soluble Cu with no excessive amounts liberated about pH 5.5. The presence of calcium arsenate in the mixture complicated the results, but usually the lower the pH, the higher the water-soluble As. Mixtures with reactions above pH 11 liberated very little soluble As; below this point, varying amounts were liberated. Copper oxychloride exerted a stronger buffer action than either cuprous oxide or tribasic copper sulfate and may consequently be safer in relation to water-soluble Cu in dusts not containing calcium arsenate. This was not true, however, when calcium arsenate was a part of the mixture because the buffer capacity of the oxychloride tended to lower the pH below 11, with a consequent liberation of water-soluble As. Since cuprous oxide and tribasic copper sulfate lacked this buffer capacity, mixtures containing them tended to have a pH above the danger point and were probably safer with respect to liberation of water-soluble As. From these findings it appeared advisable that a dust containing Cu fungicides and no calcium arsenate have a reaction above 5.5; when calcium arsenate is present the reaction should be above pH 11.

Insecticide testing, [I], II, A. J. Cox (*Soap and Sanit. Chem., 20 (1944), Nos. 6, pp. 114–117, 149, illus. 8; 7, pp. 123, 125, 129, illus. 3*).—A review of test procedure for evaluating household insecticides for use in the control of flies, clothes moths, roaches, and rodents.

Toxicity studies on insecticides, H. A. Shelanski (*Soap and Sanit. Chem., 20 (1944), No. 2, pp. 107–109, 133*).—An address outlining the technic of testing insecticides which during their use may come into contact with food or other materials which in turn may be directly or indirectly ingested.

The story of DDT, V. Froelicher (*Soap and Sanit. Chem., 20 (1944), No. 7, pp. 115, 117, 119, 145*).

DDT, "now it can be told" (*Pests, 12 (1944), No. 7, pp. 6, 8*).—A brief account on the history and use of this insecticide.

Neocid: A generic term, by Geigy, of a series of insecticidal compositions of DDT for use against insects affecting man and animal (*Pests, 12 (1944), No. 7, pp. 8, 10*).

Histopathological changes following administration of DDT to several species of animals, A. A. Nelson, J. H. Draize, G. Woodard, O. G. Fitzhugh, R. R. Smith, Jr., and H. O. Calvery (*Pub. Health Rpts. [U. S.], 59 (1944), No. 31, pp. 1009–1020*).—Microscopical examinations were made on 117 animals of 9 species after administration of DDT by inunction, by stomach tube, and by admixture in the diet; though wide variations in sensitivity to it among the individuals of a species were found, the lesions were quite consistent throughout the different species. On the higher dosage levels, with animals surviving for one to several weeks, there followed typically a moderate degree of central necrosis of the liver; with longer survivals, a combination of the necrosis and a reparative hypertrophy considered a moderate subacute degeneration of the organ. The thyroid often exhibited moderate colloid depletion, less often epithelial desquamation, and rarely epithelial hyperplasia. Very slight to moderate focal necrosis of voluntary muscles occurred in about 20 percent of animals on the higher dosages. Rabbits showed certain lesions not seen in the other species—a focal necrosis of the gall bladder and an increased incidence of the "spontaneous" types of encephalitis and nephritis. Dermatitis in inuncted animals was mild throughout, except that rabbits on the highest doses had slight focal necrosis of the epidermis. For a given dosage, chickens and guinea pigs showed fewer histological lesions than the other species. A special effort was made to determine nerve cell changes in the brain and spinal cord of animals with tremors, but with the technic used no changes could be seen that were not present in the controls. Rare myocardial and adrenal lesions may be of significance. DDT caused insignificant effects (or none) on bone marrow, bone, testis, pancreas, and spleen; renal lesions were slight and infrequent. Because of the tremors of long duration induced by DDT, this compound would appear promising as an experimental agent for the neurophysiologist.

Absorption of HCN by Valencia orange fruits and leaves, E. T. Bartholomew, W. B. Sinclair, and D. L. Lindgren. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 11, pp. 309–310, illus. 4*).—As determined by recovery values, the amounts of HCN absorbed by the fruits increased almost in a straight line for each 10-min. exposure up to 60 min.; after that the curve began to flatten. With 6, 8, 10, and 12 cc. HCN per 100 cu. ft., fruits fumigated in a fumatorium at atmospheric pressure absorbed a little less than half as much HCN as those fumigated at a partial vacuum of 26 in. Approximately the same amounts of HCN were absorbed by fruits exposed to an 8 cc. dosage for 70–80 min. at atmospheric pressure as by those exposed to a similar dosage for 40 min. at partial vacuum. In tests where the HCN concentrations were constant but the exposure periods varied, no fruits were visibly injured at any of the 10-min. intervals below 50 min.; in tests where the exposure periods were constant but the concentrations varied, about half as many fruits were injured by atmospheric pressure as at partial vacuum. Results with leaves indicated that the amounts of HCN absorbed at atmospheric pressure were always less than those absorbed at the same time of day at partial vacuum; the amounts absorbed under either condition of pressure were less in leaves picked and fumigated in the morning than in those picked and fumigated in the afternoon; the amounts absorbed at atmospheric pressure in the afternoon (one exception) were greater than the amounts absorbed at partial vacuum in the morning; leaves picked at 8 a. m. absorbed less HCN than those picked at 10 a. m., 1:30 p. m., or 3:30 p. m.; and the amounts absorbed were apparently not influenced by variations in the moisture content of the leaf samples.

Fruit-leaf HCN absorption, E. T. Bartholomew, W. B. Sinclair, and D. L. Lindgren. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 9, pp. 6–7, 22, illus. 4*).—See preceding abstract.

Methyl bromide poisoning, with special reference to nervous system manifestations, R. N. DeJong (*Jour. Amer. Med. Assoc., 125 (1944), No. 10, pp. 702–703*).—Methyl bromide—used extensively during recent years, first as a refrigerant, later as a fumigant, and more recently as a delousing agent—is reported to be toxic to man, and nervous system or other complications may arise from exposure to it. Though it can be handled without injury if used intelligently, its toxic potentialities must be borne in mind and its indiscriminate and careless use avoided.

Activation of pyrethrins by sesame oil, E. A. Parkin and A. A. Green (*Nature [London], 154 (1944), No. 3896, pp. 16–17*).—In the chamber tests on houseflies described, activation of the toxicity of pyrethrins by sesame oil appeared to depend mainly on the sesamin content of the oil, and increase in kill was accompanied by a small increase in the rate of knock-down. There is also believed to be present a complex of secondary factors which, according to the composition of the sesame oil, may increase or decrease the effect of the pyrethrins and/or sesamin in a fly spray.

Latin America as a source of rotenone, E. N. Bressman (*Soap and Sanit. Chem., 20 (1944), No. 9, pp. 101–103, 129, 131, illus. 3*).

Dispersants for rotenone, R. L. Janes and H. F. Wilson. (Univ. Wis.). (*Soap and Sanit. Chem., 20 (1944), No. 9, pp. 107, 109, 111, illus. 2*).—The experiment here summarized dealt primarily with pea aphid control by materials designated as talc, pyrophyllite, and $CaCO_3$. With use of pyrophyllite (Pyrax) and $CaCO_3$, the plotted points were on a horizontal line, and it is concluded that a rotenone concentration of 0.25 or even 0.1 percent might be employed without appreciable decrease in effectiveness over the customary 1 percent. In comparisons of Wisconsin talc, soapstone, Hartford talc, eastern magnesia talc, Virginia blue talc, and Virginia yellow talc, statistically significant differences between levels were found, the dependence of effectiveness on concentration exhibiting a nonlinear trend with the possible exception of soapstone. The general conclusions seemed to be that with each of these substances concentrations of 0.75 percent and 0.5 percent resulted in kills not differing significantly—statistically speaking—from the kill at a 1-percent concentration. It therefore appears that a concentration of 0.75 or 0.5 percent may be expected to prove as effective in practice as the customary 1 percent. With Wisconsin talc, soapstone, and possibly Hartford talc use of even a 0.25-percent concentration might be employed without appreciable loss in effectiveness as compared with the usual practice.

Studies of certain cyrtacanthacridoid genera (Orthoptera: Acrididae).—I, The Podisma complex. II, Prumnacris, a new North American genus of holarctic type, J. A. G. and J. W. H. Rehn (*Amer. Ent. Soc. Trans., 65 (1939), No. 2, pp. 61–96, illus. 21; 70 (1944), No. 1–2, pp. 1–21, illus. 20*).—This series was planned to make available conclusions drawn from comparative studies which throw light on the relationship of the genera discussed, the features of the group or groups of genera involved, and the origin and distribution of these groups of locusts or short-horned grasshoppers.

The bionomics of Schistocerca obscura (Fabr.), L. G. Duck (*Jour. Kans. Ent. Soc., 17 (1944), No. 3, pp. 105–119*).—In the region of Stillwater, Okla., cotton, elm, green mature corn, leaves, persimmon, and young wheat are said to be the preferred foods for this locust. The precopulation period of the ♀ was found to be 18 days; the preoviposition period after copulation 44.1 days. The interoviposition period between the first and second egg pods averaged 8 days; between the second and third pods 9–21 days. The number of eggs per pod averaged 75.4 for the first, 42 for the second, and 31 for the third pod. The incubation period averaged 261.3 days for eggs stored at outside temperatures and 83.1 days for those stored at room temperatures (about 68° F.). The average hatch for eggs was 10.87 percent for those stored at room temperature and 50.3 percent for those stored outside. The total duration of the nymphal period outside was 51.5 days as compared with 46.1 days for those reared at 89.9° and 51.2 days for those reared at 85°. Nymphs reared at 70° failed to complete the fifth nymphal period before termination of the study, but development of the earlier stages at lower temperatures indicated that much more time would be required under such conditions. There are 16 references.

The caddis flies, or Trichoptera, of Illinois, H. H. Ross (*Ill. Nat. Hist. Survey Bul., 23 (1944), Art. 1, pp. 326+, illus. 962*).—A monographic study, including new taxonomy. According to the foreword, by T. H. Frison, "the caddis flies . . . are one of the most abundant groups of aquatic insects in Illinois. In both lakes and streams they constitute an important factor in the food economy of our Illinois fishes. For this reason, and because the fauna of the order in the entire Middle West was virtually unstudied, a survey of the caddis flies of Illinois was undertaken. . . . Since 1931, Dr. Herbert H. Ross . . . has been responsible for the continuation and completion of the project."

An annotated list of the Odonata of Maine, D. J. Borror. (Ohio State Univ.). (*Canad. Ent., 76 (1944), No. 7, pp. 134–150*).—Includes 44 literature references.

A key to the genera of anisopterous dragonfly nymphs of the United States and Canada (Odonata, suborder Anisoptera), M. Wright and A. Peterson. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 4, pp. 151–166, illus. 6*).

A brief note on the habits of Amobia (Pachyophthalmus) floridensis Townsend (Diptera: Sarcophagidae), E. G. Linsley. (Univ. Calif.). (*Pan-Pacific Ent., 20 (1944), No. 3, p. 118*).—This sarcophagid fly appears to be a common inhabitant of mud nests of the wasp *Sceliphron servillei.*

Notes on the biology of Dexia rustica F., a dipterous parasite of Melolontha melolontha L., M. G. Walker (*Zool. Soc. London Proc., 1944, Ser. A, III–IV, pp. 126–176, illus. 15*).—There are in Great Britain four important chafer species

(*M. melolontha, Amphimallus solstitialis* L., *Phyllopertha horticola* L., and *Serica brunnea* L.), the larvae of which—known as white grubs—feed on the roots of plants, including young trees and grass, thus causing considerable damage. In examining large numbers of the white grubs of all four species from various localities for parasites, only one—the tachinid *D. rustica*, the larvae of which burrow into the host grub—was found. With one exception, the presence of this parasite in an area was always associated with the presence of *M. melolontha*. A brief discussion of the genus *Dexia* is followed by a detailed presentation of laboratory and field studies (including the technics used) of the biology of this parasite. From the economic standpoint, it is concluded that *D. rustica* plays a limited, though useful, role as an agent in the natural control of *M. melolontha*.

The genus Flebotomus in California, O. MANGABEIRA, JR., and P. GALINDO. (Univ. Calif. et al.). *Amer. Jour. Hyg., 40 (1944), No. 2, pp. 182–198, illus. 26).*—*F. vexator* Coq. and *F. stewarti* n. sp. are described and illustrated; this is believed to be the first published record of the genus from western North America. The systematic position of the American species of *Flebotomus* with five spines on the distal segment of the upper gonapophyse (clasper) is clarified. There are 34 references.

Tabanidae of the island of Trinidad, B. W. I., J. BEQUAERT (*Bul. Ent. Res., 30 (1940), No. 4, pp. 447–453*).—This annotated enumeration of the horseflies of Trinidad includes 23 species and is based almost entirely on specimens seen by the author.

Further studies of the Tabanidae of Trinidad, B. W. I., J. BEQUAERT (*Psyche 51 (1944), No. 1–2, pp. 12–21*).—Supplementary studies (see preceding entry) are presented on 31 members of the horsefly group.

Undescribed species of Tipulidae from the western United States (Diptera), I, C. P. ALEXANDER. (Mass. State Col.). (*Pan-Pacific Ent., 20 (1944), No. 3, pp. 91–97*).—Five new species of crane flies are described.

Further notes on the habits of some flat bugs, with a description of the male of Aradus patibulus Van Duzee (Hemiptera: Aradidae), E. G. LINSLEY and R. L. USINGER. (Univ. Calif.). (*Pan-Pacific Ent., 20 (1944), No. 3, pp. 111–114*).

The structure of the antenna of Aphis (Dorsalis) fabae Scopoli and of Melanoxantherium salicis L. (Hemiptera) and some experiments on olfactory responses, M. G. JONES (*Roy. Ent. Soc. London Proc., Ser. A, 19 (1944), No. 1–3, pp. 13–22, illus. 5*).—The external and internal structures of the antennae of *A. fabae* are described; one antennary nerve is present, and the sensoria and hairs are innervated by well-marked sense cells. Only small differences in these respects were exhibited by *M. salicis*. The essential similarity of the antennal structure in the pea aphid and green peach aphid with that in *A. fabae* is noted. When a population of *A. fabae* of mixed origin was passed through an olfactometer, there was no well-marked response to the odor of host plant extracts or leaves, but there was a small positive response to a dry current as compared with a wet one. One of the functions of the secondary sensoria on the antennae may be to indicate the suitability of weather conditions such as humidity and wind velocity for flight.

Mallophaga of Alberta: A list of species with hosts, J. H. BROWN and A. L. WILK (*Canad. Ent., 76 (1944), No. 6, pp. 127–129*).

Descriptions of some new North American Psyllidae with notes on others, L. D. TUTHILL. (Iowa State Col.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 1, pp. 1–6, illus. 13*).—New species of *Psylla, Rhinopsylla,* and *Trioza* are described.

The remarkable distribution of an American cicada; a new genus, and other cicada notes, W. T. DAVIS (*Jour. N. Y. Ent. Soc., 52 (1944), No. 3, pp. 213–222, illus. 4*).—Notes on *Quesada gigas* Oliv.; *Cornuplura* n. gen., based on *Tibicen curvispinosa* as a type; and two species of *Okanagana,* including a new color form.

Notas coccidológicas (Homoptera: Coccoidea) (Notes on some Coccoidea (Homoptera)), H. S. LEPAGE and O. GIANNOTTI (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 331–350, illus. 41; Eng. abs., p. 350*).—Twelve species of scale insects of the superfamily Coccoidea in Brazil are considered, including new taxonomy.

A new genus—Premanus—and species of Mexican leafhopper related to Omanana (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Pan-Pacific Ent., 20 (1944), No. 3, pp. 98–100, illus. 1*).—*P. hebatus* n. gen. and sp. are described.

Notas sôbre a biologia de "Ecpantheria hambletoni Schaus" (Lepid.: Arct.) (Biological notes on E. hambletoni Schaus (Lepid.: Arct.)), H. F. G. SAUER (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 73–80, illus. 4; Eng. abs., p. 79*).—Information is presented on this lepidopterous pest of roselle, loquat, and upland cotton in the State of São Paulo, Brazil. Under laboratory conditions the larvae were also bred on several other host plants, and one natural enemy of the pupal stage was found.

A new Amblycerus affecting seeds of Prosopis chilensis in Puerto Rico and Hispaniola, J. C. BRIDWELL (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1944), No. 3, pp. 133–135*).—*A. martorelli* Bridwell n. sp. is described.

List of Chrysomelidae (Coleoptera) known to occur in Ohio, J. H. HUGHES (*Ohio Jour. Sci., 44 (1944), No. 3, pp. 129–142*).—An annotated list of the leaf beetles of this family, including records of 298 species and varieties for the State, of which 192 were collected by the author.

Economic importance and host relationship of Pelecinus polyturator Drury, G. H. HAMMOND (*Canad. Ent., 76 (1944), No. 6, p. 130*).—A note on the parasitism of *Phyllophaga* larvae by *Pelecinus polyturator*. It is believed that this widespread parasite destroys important numbers of white grubs. Thus far the parasite has not been reared from other than *Phyllophaga* in Ontario and Quebec.

A new species of Phloeonemus from Puerto Rico (Coleoptera: Colydiidae), W. S. FISHER. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1944), No. 3, pp. 131–132*).—*P. martorelli* n. sp. is described.

Distribution and hosts of Arkansas Phyllophaga (Coleoptera: Scarabaeidae), M. W. SANDERSON. (Ark. Expt. Sta.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 1, pp. 14–21*).—Forty-four species of *Phyllophaga* (May beetles) are known to occur in Arkansas. Their distribution within the State, their seasonal distribution, the adult host plants, and their occurrence at light are the matters considered in this report. Such information is an essential preliminary for developing control measures against a group including a large number of species, several of which may be abundant in one region and whose biologies and habits may differ.

A new encyrtid parasitic in the eggs of Hesperiidae, A. B. GAHAN. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1944), No. 3, pp. 137–139*).—*Ooencyrtus prenidis* n. sp. is described.

Vernal flight of males in some western bumblebees (Hymenoptera: Bombidae), E. G. LINSLEY. (Univ. Calif.). (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 2, pp. 48–49*).

Synonymical notes on the Psenine wasps (Hymenoptera: Sphecidae), V. S. L. PATE (Cornell Univ.). (*Canad. Ent., 76 (1944), No. 7, p. 133*).

Host relationships of some sapygid wasps (Hymenoptera: Sapygidae), E. G. LINSLEY. (Univ. Calif.). (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 2, pp. 54–55*).—The species of *Sapyga* were found to parasitize megachilid bees of some six genera and species of *Eusapyga* two genera (listed). "Probably both generic lists will be increased when the biologies of our species are more fully known."

Chafer damage to grassland in north Wales in 1942–1943 by Phyllopertha horticola L. and Hoplia philanthus Fuess.—I, Notes on population, life history and morphology, I. THOMAS and G. M. HEAL (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 124–131, illus. 12*).—The authors report on a severe attack to grassland by larvae of these beetles in some northern Wales valleys (1942–43). Estimations of the populations of each species were made, and notes are presented on the biology and comparative morphology of their immature stages. Both have a 1-yr. life cycle, but all stages of *H. philanthus* occurred somewhat later than *P. horticola.*

Soybeans and kudzu may be attacked by velvetbean caterpillar, C. LYLE (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 9, p. 1*).—A practical account.

The alfalfa plant bug and other related plant bugs on alfalfa in Minnesota, and their control, J. H. HUGHES (*St. Paul., Minn.: Iron Range Resources and Rehabil. Comn., 1943, pp. 17, illus. 6*).—An abbreviated account of the study previously noted (E. S. R., 90, p. 506).

Combate à broca do algodoeiro "Gasterocercodes brasiliensis Hambl." (Col.: Curc.), nociva às culturas do algodão arbóreo (Control of the cotton borer G. brasiliensis Hambl. (Col.: Curc.), a pest of perennial cotton culture), H. F. G. SAUER (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 1–14, illus. 13; Eng. abs., p. 14*).—Various aspects of perennial cotton culture in the northern States of Brazil as well as the economic importance and control of *G. brasiliensis.*

Studies of the vitality of the beet leafhopper during the fall and winter in California as related to the fat content of the insects, W. C. COOK. (U. S. D. A.). (*Ecology, 25 (1944), No. 3, pp. 327–340, illus. 5*).—The number of days the ♀♀ could live without food at 20° C. (water supplied) was used as a test of vitality. Longevity under starvation conditions was very high during early fall, but declined gradually until winter. With insects fed on the sugar beet—a favorable host—an equilibrium was reached during January, whereas with insects taken from desert sage—an unfavorable host—no equilibrium was reached, but vitality declined until eventual death of all individuals. The ether-extractive content of the leafhoppers followed a similar course, and the correlation between ether-extractive content and longevity was very high. The regression indicated that about 0.0168 mg. of ether extractives was lost for each day of starvation at 20°. Laboratory experiments in which caged insects were tested during three fall and winter seasons and field collections taken during the same seasons agreed closely in both longevity and ether extractives.

Investigations of sugarcane borer control by the use of resistant varieties, R. MATHES and J. W. INGRAM. (U. S. D. A.). (*Sugar Bul., 22 (1944), No. 21, pp. 189–192*).—This is a progress report on records of the resistance of common varieties to the sugarcane borer, comparative infestation of promising new varieties, and on selection and breeding for resistance. The comparative susceptibility of parent varieties and their progeny has been under study for the past 6 yr.; over 200 different parents were used in producing about 16,000 seedlings on which borer-resistance observations have been made. Results of this work have made it possible to rate many of the parents and their progeny with respect to resistance and are sufficiently encouraging to warrant continuation of the program. Thus far nine varieties have maintained their resistant status throughout the tests to such an extent that they have been recommended for use in breeding for borer resistance.

Las posibilidades de combatir el barreno de la caña de azucar, Diatraea saccharalis F., en Puerto Rico llevando a los cañaverales los parasitos Trichogramma minutum Riley criados en laboratorio [The possibilities of controlling the sugarcane borer (D. saccharalis) in Puerto Rico under field conditions by the use of laboratory-reared parasites (T. minutum)], G. N. WOLCOTT and L. F. MARTORELL (*Puerto Rico Univ. Sta. Bul., 64 (1943), Span. ed., pp. 16+,* *illus. 1; Eng. abs., pp. 15–16*).—A Spanish edition covering work previously reported (E. S. R., 89, p. 714).

Métodos de laboratório para observação e criação de "Diatraea saccharalis (Fabricius, 1794)", a broca de cana (Laboratory methods for observation and rearing of D. saccharalis (Fabricius, 1794), the sugar cane borer), J. Bergamin (*Arq. Inst. Biol.* [*São Paulo*], *14* (*1943*), *pp. 351–354, illus. 2; Eng. abs., p. 354*).

A "escama vermelha" dos citrus em São Paulo, "Aonidiella aurantii (Maskell)" (Homoptera: Coccoidea) (The "red-scale" on citrus in the State of São Paulo, A. aurantii (Maskell) (Homoptera: Coccoidea)), H. S. Lepage (*Arq. Inst. Biol.* [*São Paulo*], *14* (*1943*), *pp. 311–330, illus. 20; Eng. abs., p. 328*).—This paper presents a review (10 references) on the California red scale, including data on its geographical distribution, and notes on its biology, incidence, and control in the State of São Paulo, Brazil.

Contribuição para o conhecimento da biologia da broca do café "Hypothenemus hampei (Ferrari, 1867)" (Col.: Ipidae) (Contribution to the knowledge of the coffee berry-borer H. hampei (Ferrari, 1867) (Col.: Ipidae)), J. Bergamin (*Arq. Inst. Biol.* [*São Paulo*], *14* (*1943*), *pp. 31–72, illus. 7, Eng. abs., pp. 67–68*).—The life history, habits, and geographic distribution of *H. hampei* are discussed. Oviposition and weevil development may continue throughout the year. Longevity of the ♀♀ was 81–282 days, the average for 54 being 156.6 days; that of the ♂♂, 78–103 days. The proportion of the sexes was 1 ♂ to 9.75 ♀♀. Mating occurred within the fruit in which the brood was reared, usually 4 days after reaching the adult stage. In the laboratory, the average oviposition period was 11–15 days. The average number of eggs per ♀ for a lot of 54 was 74; a minimum of 31 and a maximum of 119 were recorded. The incubation period was 4–16 days. Two molts were reported for the ♀ and 1 for the ♂ larvae. Host fruit conditions and temperature are important in determining the rate of larval growth. The larval period lasted for 9–20 days, with an average of 13.8. The mature larva forms a cell and enters the prepupal stage, which lasts for 2–6 days. The pupal stage lasted for 4–10 days, with an average of 6.4 days. The average time for a lot of individuals to complete their entire life cycle ranged from 21 to 63 days, with an average of 27.5. Parthenogenesis did not occur, though egges were laid by virgin ♀♀. Seven generations were observed in one year. There are nearly four pages of references.

Insect infestation of dehydrated foodstuffs, E. G. Linsley. (Univ. Calif.). (In *Third Dehydration Conference, January 21–22, 1944. Berkeley: Calif. Univ., 1944, pp. 25–29*).

Common insect pests of stored food products: A guide to their identification, H. E. Hinton and A. S. Corbet (*Brit. Mus.* (*Nat. Hist.*), *Econ. Ser. No. 15* (*1943*), *pp. 44+, illus. 87*).

Keys for the identification of the Lepidoptera infesting stored foods products, A. S. Corbet and W. H. T. Tams (*Zool. Soc. London Proc., 1943, Ser. B, III, pp. 55–148, illus. 292*).—In these keys an attempt has been made to give salient characters whereby the adult moths of the larvae infesting stored products can be readily identified. A bibliography of the more important works consulted and an index to the species are included.

Investigations of the flour beetles of the genus Tribolium.—I, The incidence of T. castaneum (Hbst.) and T. confusum (Duv.) in wheat and flour in Victoria. II, Effect of different mill fractions on the larval development and survival of T. castaneum (Hbst.) and T. confusum (Duv.), L. W. Miller (*Jour. Dept. Agr. Victoria, 42* (*1944*), *Nos. 5, pp. 217–219, 221; 8, pp. 365–373, 377, illus. 5*).

The effect of crowding upon the natality of grain-infesting insects, A. C. Crombie (*Zool. Soc. London Proc., 1944, Ser. A, III-IV, pp. 77–98, illus. 4*).—

Over certain ranges of density the fecundity of the confused flour beetle and the saw-toothed grain beetle in unconditioned media was reduced by interference with the gravid ♀♀ resulting from competition for the limited "oviposition space." The effect of density on fecundity was immediate, as was also recovery after reduction of density. The egg fertility of neither species was affected by adult density. Under the experimental conditions, the proportion of eggs eaten in a given time by adults of each species was directly proportional to the number of adults per gram of flour. The decrease in number of eggs found per ♀ per day with increasing density is thus explained partly by the higher rate at which eggs are eaten as density increases, and partly by the effect of crowding on fecundity over certain ranges of density for each species. When the two species were competing for the same oviposition space the number of *Tribolium* eggs found was reduced by less, and of the *Oryzaephilus* eggs by more, than when each species was competing only within itself. Fecundity returned to the normal rate after a longer or shorter period in fresh flour, and egg fertility was not affected by conditioned medium. Furthermore, there appeared to be no radical difference between the effects of homotypically and heterotypically conditioned media on the fecundity of either species.

It is believed probable that the rate of growth of populations of each and the outcome of competition between them will depend on their relative cannibalism and predation. The proportion of eggs and possibly of pupae eaten per unit time was a linear function of the number of feeding stages and of prey stages per gram of flour. When the two species compete for the same environment of flour *Oryzaephilus* suffers more heavily than *Tribolium*. Since *Oryzaephilus* larvae do not attack *Tribolium* eggs, only such eggs as are in the surface layers would be destroyed by *Oryzaephilus*. It is inferred that the latter would tend to be suppressed in media in which it was competing with *Tribolium* for the same ecological niche. Data are given on the rates at which the adults and larvae of both species consume their normal food. Comparisons with similar studies by others are made (45 references).

The role of sorption in the fumigation of stored grain and milled cereal products, R. T. Cotton, H. H. Walkden, and R. B. Schwitzgebel. (U. S. D. A.). (*Jour. Kans. Ent. Soc., 17 (1944), No. 3, pp. 98–103*).—Fumigants were found to be retained by wheat for unusually long periods, with the result that this insecticidal action is extended much longer than would ordinarily be suspected; this retention depended on the gas used, the amount applied, and the temperature of the grain. The 3–1 mixture of ethylene dichloride and carbon tetrachloride is usually applied in larger quantities than most grain fumigants and may be retained in killing concentrations as long as 4 mo. This long-time retention serves the very useful purpose of protecting bins of wheat from migrating insects during the critical period in late summer and early fall, when grain temperatures are high enough to favor insect breeding. Owing to the long-time retention of fumigants by wheat in steel bins, fumigants formerly considered too low in toxicity to be of practical value can be used very successfully. Data at present available indicate that in spite of considerable loss in viability of wheat due to fumigation, little consistent damage results to the baking qualities of flour made from such wheat.

Mercury as a control for stored grain pests, D. W. Wright (*Bul. Ent. Res., 35 (1944), No. 2, pp. 143–160, illus. 1*).—The Indian custom of placing metallic mercury with grain in storage containers to prevent infestation by insects was found to have a sound scientific basis as the presence of Hg prevents reproduction of certain of these pests; Zn and Sn amalgams and calomel proved less effective. The efficiency of a given weight of Hg was increased by subdivision, which increased its total surface area. Those mercurials proving effective were found to emit a vapor containing free Hg. The vapor was fully effective in preventing reproduction of *Calandra granaria* L., the saw-toothed grain beetle, the lesser grain borer, and the angoumois grain moth. Storage in Hg vapor had no effect on the viability of adults of *C. granaria,* nor did it affect their subsequent reproductive capacity; its eggs and those of the angoumois grain moth were very susceptible and failed to hatch in the presence of the vapor. Germination and spectroscopic tests on grain stored for several months with Hg gave no indication that contamination had resulted; *C. granaria* was able to breed vigorously in grain which had been so stored.

Control of mill insects, R. T. Cotton, A. I. Balzer, and J. C. Frankenfeld. (U. S. D. A.). (*Amer. Miller, 72 (1944), No. 4, pp. 41, 99–100, 110, illus. 1; also in Pests, 12 (1944), No. 8, pp. 16–18, illus. 1*).—Observations have shown that flour beetles of the genus *Tribolium* constitute the greater part of the insect population of every flour mill. This paper presents brief experimental data on their development in flour mills and on control by fumigation.

Life histories and control tests on three insect pests of skins stored in the tannery, F. H. Walker, Jr. (*Jour. Kans. Ent. Soc., 17 (1944), No. 1, pp. 7–14*). —Of the three insects found feeding on skins, only one—the hide beetle—caused annual losses. The webbing cloths moth was present in sufficient numbers to cause some damage during one season only, while the red-legged ham beetle—though present annually—occurred in such small numbers as to cause but little injury. The hide beetle was a pest on all dried skins stored for any length of time. The work was done primarily to perfect control measures suited to this particular situation, but observations were also made on life histories and habits. The insecticides used had to be nonpoisonous when applied to the skins and the fumigant as safe as possible since other floors in the same building were in use; they must not injure the skins or affect the leather-making process unfavorably. The fumigant also had to have a high killing power and good penetration. Based on the results of tests on different materials, orthodichlorobenzine was used as a contact insecticide, with paradichlorobenzine as a fumigant. These control measures have only temporary value, however, for if the skins are exposed outdoors during the warmer months they may become reinfected.

Regression of insect density on distance from center of dispersion as shown by a study of the smaller European elm bark beetle, F. M. Wadley and D. O. Wolfenbarger. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 7, pp. 299–308, illus. 2*).—This paper gives consideration to dispersion of the smaller European elm bark bettle from heavily populated centers. Two cases were studied, one in New Jersey and the other in Connecticut, and twig feeding by newly matured adults was taken as an index of density. No directional influence could be detected; regression of density on distance was definitely curvilinear. The high level of general activity around the center extended only a few hundred feet. Best results in fitting were given by the curve of the equation $Y = a + b \log X + c/X$, in which X is the distance and Y is the density.

The spruce budworm, R. C. Brown (*U. S. Dept. Agr. Leaflet 242 (1944), pp. 4+, illus. 1*).—A practical account.

The depletion of starch from timber in relation to attack by Lyctus beetles.—V, The effect upon starch content of storing timber in the log, E. A. Parkin (*Forestry, 17 (1943), pp. 61–66*).—According to this further contribution (E. S. R., 83, p. 527), observations on short lengths of oak, ash, and walnut branch wood showed that depletion of starch from sapwood proceeds so long as the wood retains sufficient moisture for the cells to remain alive. During depletion the risk of fungus stain or decay depended on the species of timber and the conditions under which kept. Ash logs usually possessed a wide band of starch-containing tissues that could not normally be rendered starch-free by storage under natural conditions for a year. The relatively narrow band of sapwood on oak logs, on the other hand, could generally be rendered starch-free by storage of the logs in the open or under cover for 12 mo., irrespective of whether or not the bark had been removed.

Notes and new distribution records on the mosquitoes of North Carolina, H. F. SCHOOF and D. F. ASHTON (*Jour. Elisha Mitchell Sci. Soc., 60 (1944), No. 1, pp. 1–10*).—Operation of the malaria control programs in the State (1937–43) has necessitated extensive entomological observations; although chiefly concerned with anophelines, they have contributed greatly to the general knowledge of the mosquito fauna. Data are here presented for species relatively rare or hitherto unknown in North Carolina.

A new species of Anopheles from the Solomon Islands, J. N. BELKIN and R. J. SCHLOSSER (*Jour. Wash. Acad. Sci., 34 (1944), No. 8, pp. 268–273, illus. 11*).—*A.* (*Myzomyia*) *lungae* n. sp. is described.

Some relationships of Anopheles lungae Belkin and Schlosser (Diptera: Culicidae), A. STONE. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 8, pp. 273–276, illus. 1*).—The species described in the preceding paper is compared with certain closely related species not available to the describers.

Differentiation of females of certain species of Culex by the cibarial armature, C. D. MICHENER (*Jour. N. Y. Ent. Soc., 52 (1944), No. 3, pp. 263–266, illus. 1*).—The characters of the "pharyngeal" armature—here described—are said to support the usual subgeneric classification and also to serve in differentiating the ♀ mosquitoes previously considered indistinguishable in certain species.

Mosquito transfer of the pigeon strain of Plasmodium relictum, W. B. REDMOND (*Jour. Infect. Diseases, 74 (1944), No. 3, pp. 184–188*).—The northern house mosquito transmitted the 1P1 (canary) strain of *P. relictum* from canary to canary, but not from pigeon to pigeon or from canary to pigeon. The yellow-fever mosquito failed to transmit this strain either to canaries or to pigeons. Injections of sporozoites failed to cause infections in pigeons but did so in all three canaries so treated. After mosquito transfer from canary to canary no infections were obtained in 12 pigeons following blood inoculation. After transfer by blood inoculation to the canary, the strain has been designated the 1P1 strain; after mosquito transfer, the 1P1–1 strain of *P. relictum.*

Some epidemiological characteristics of malaria in north Alabama as determined by data collected over the twenty-year period 1923-42, R. B. WATSON and M. E. RICE (*Amer. Jour. Hyg., 40 (1944), No. 2, pp. 199–208, illus. 5*).—Parasitological data from examinations of 58,668 blood films, together with records of the common malaria mosquito collections, are arranged to show the trend of malaria prevalence and, seasonally, the influence of anophelism on its prevalance. The seasonal trend was influenced principally by *Plasmodium vivax* infections with two periods of increasing prevalence. The period of major increment in late summer and early fall followed peak production of the common malaria mosquito, while the period of vernal increment was composed principally of relapses of infections acquired about 7 mo. previously. Further details, including control work, are discussed.

Observations on the epidemiology of jungle yellow fever in Santander and Boyacá, Colombia, September, 1941, to April, 1942, J. BOSHELL-MANRIQUE and E. OSORNO MESA (*Amer. Jour. Hyg., 40 (1944), No. 2, pp. 170–181, illus. 3*).—The vectors in which virus was demonstrated were *Haemagogus capricornii* Lutz and probably *Aedes leucocelaenus Theob.;* the former was the vector showing ability to transmit the virus by bite to the rhesus monkey. Because of the topography of the country, infection of man appeared to result from dispersion of the vector from the forests in the deepest parts of the valleys; this again emphasizes the purely jungle origin of the virus. In some regions, marsupials were found with serological reactions tending to suggest recent infection. Possible transmitters were *H. equinus* Theob. and *H. lucifer* Howard, Dyer, and Knab.

An experiment on the effect of sodium chloride upon the larvae of Culex pipiens Lin., J. W. NOAKS (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 2, pp. 52–53, illus. 1*).—Since the northern house mosquito breeds in fresh water, it was deemed of interest to compare its salt death point with that of the salt-marsh mosquito. From the experiment reported, it is concluded that 0.250 N is the point at which the larvae of the former species begin to die when using dilutions of NaCl.

Mosquito control: Practical methods for abatement of disease vectors and pests, W. B. HERMS and H. F. GRAY (*New York: Commonwealth Fund, 1944, 2. ed., rev. and enl., pp. 419+, illus. 97*).—A revised and enlarged edition of the work previously noted (E. S. R., 84, p. 219).

Activated pyrethrum mosquito spray, E. R. McGOVRAN and J. H. FALES. (U. S. D. A.). (*Soap and Sanit. Chem., 20 (1944), No. 2, pp. 117, 119*).—Tests on adults of the yellow-fever mosquito in which the Peet-Grady equipment was used indicated that the adult ♀♀ of this species are killed by very low concentrations of pyrethrins in oil sprays. Sesame oil and normal isobutylundecyleneamide, when added to these low concentrations of pyrethrins in kerosene sprays, increased their effectiveness against mosquitoes but to a much lower degree than has been reported for houseflies.

Ingested thiamin chloride as a mosquito repellent, C. S. WILSON, D. R. MATHIESON, and L. A. JACHOWSKI (*Science, 100 (1944), No. 2590, p. 147*).—Experiments briefly reported upon failed to confirm claims that thiamine chloride relieves the itch of mosquito bites and prevents further biting.

Outdoor protection from mosquitoes, J. M. GINSBURG. (N. J. Expt. Stas.). (*Jour. N. Y. Ent. Soc., 52 (1944), No. 3, pp. 247–254*).—A brief review of mosquito repellants—their advantages and disadvantages—is followed by a summary of work on the New Jersey Pyrethrum Mosquito Larvicide as a spray for outdoor protection against mosquitoes, beginning with the preliminary tests by the author in 1934 (E. S. R., 74, p. 72). Directions for spraying this combined insecticide and repellant are given, and its present status is discussed. Intensive testing is now being conducted with other chemicals as possible substitutes for pyrethrum, but as yet none has proved equal to it as to effectiveness against mosquitoes and safety to man, animals, and plants.

Alguns aspetos das relações do "Habronema muscae (Carter, 1861)" com a Mosca doméstica (Some aspects of the relations between H. muscae (Carter, 1861) and the house-fly), M. J. MELLO and R. CUOCOLO (*Arq. Inst. Biol. [São Paulo], 14 (1943), pp. 227–234, illus. 3; Eng. abs., pp. 232–233*).—This study deals with the relations of houseflies to this roundworm parasite in horse manure. The fly was not found infested in the egg stage or in the first 24 hr. of the maggot stage. The main infestation of the maggots occurred at the second day, and at the third day they were almost free of the parasite. The manure of affected horses proved capable of infesting the housefly for 9 days. In the maggots the roundworm larvae were found in the cytoplasm of certain cells, which undergo necrosis. In the pupae, the parasitized cells are destroyed, there remaining only a cystlike wall enclosing the larva. In the adult fly, the larvae are said to break through this wall and the first day are almost exclusively located in the abdomen; in the second and third days they are distributed mainly in the head, but also in the thorax and abdomen; in the fourth and following days the larvae are all assembled in the head of the fly.

Comparison of various media suggested for the cultivation of germ-free Musca domestica from eggs to adults, B. TEAH (*Jour. Bact., 48 (1944), No. 1, p. 120*).—An abstract.

Pyrethrum synergists: Toxicity to houseflies of certain N-substituted piperonylamides and benzamides combined with pyrethrins in oil base insect sprays, W. A. GERSDORFF and S. I. GERTLER. (U. S. D. A.). (*Soap and Sanit. Chem., 20 (1944), No. 2, pp. 123, 125, illus. 1*).—In the tests on houseflies reported, N, N-dibutylbenzamide was much more effective than N-butylbenzamide but much less so than the piperonylamides used. At 4 mg. per cubic centimeter the three piperonylamides (N-isobutyl-, N-butyl-, and N,N-diethyl-), when mixed with 0.5 mg. of pyrethrins per cubic centimeter, each gave a spray causing a much higher kill than 2 mg. of pyrethrins, and at 2 mg. per cubic centimeter these amides under the same conditions gave sprays equal to or better than the same concentration of pyrethrins.

Simple experiments on the behaviour of body lice (Siphunculata), J. R. BUSVINE (*Roy. Ent. Soc. London Proc., Ser. A, 19 (1944), No. 1–3, pp. 22–26*).—Experiments consisting of the release of lice on or near the human body and the search for them after an interval of time are described. The results indicate where and how far lice are likely to travel under certain circumstances and provide some information as to how readily man may become infested. Trials with an antilouse typhus protection gown are briefly reported upon.

Chicken louse control, H. S. TELFORD (*Soap and Sanit. Chem., 20 (1944), No. 8, pp. 113, 139*).—In the experiments reported, 4 percent DDT, 0.5 percent nicotine, and 33 percent sodium fluoride dusts in pyrophyllite proved efficacious in controlling the chicken body louse; nicotine gave poor control of the shaft louse *Menopon gallinae* (L). Within 28 hr., 4 percent DDT freed all birds of lice, and complete control was obtained with 33 percent sodium fluoride within 52 hr. (1 bird was apparently freed within 28 hr.). The shaft louse seemed more resistant to these agents than the body louse. Under the experimental conditions no apparent harmful effects resulted in the use of these chemicals, either on operators or birds.

Spider control, M. S. PRESCOTT (*Pests, 12 (1944), No. 7, pp. 31–32*).—A preliminary report on experimental work for control of spiders in buildings, particularly large apartment houses. A spray formula giving very satisfactory results was made up of Dispersol or Deobase, Velsicol AR 50, and Lethane No. 384 Special. The spider involved was tentatively identified as *Aranea undata*.

Honey getting, E. L. SECHRIST (*Hamilton, Ill.: Amer. Bee Jour., 1944, pp. 128, illus. 41*).—A presentation of the fundamentals of beekeeping as applied to the production of honey. Emphasis is placed on six essential factors, viz, adequate colony population, location of apiaries where there is sufficient nectar production, prompt starting of work in supers at the beginning of the honey flow, uninterrupted continuation of work in the supers, continuous replacement of bees that die, and colony condition at the end of the season so that it can store a good crop of honey the next year. The eight essentials of practice which will produce and maintain in operation these six factors are discussed.

Hive management in Alberta, W. G. LE MAISTRE (*Gleanings Bee Cult., 72 (1944), No. 9, pp. 395–397, illus. 3*).—The author describes what systems of management are generally employed in Alberta and why they came into use.

ANIMAL PRODUCTION

Animal nutrition and veterinary dietetics, R. G. LINTON and G. WILLIAMSON (*Edinburgh: W. Green & Son, 1943, 2. ed., pp. 510+, illus. 5*).—A revised and enlarged edition of the book previously noted (E. S. R., 58, p. 166), incorporating many of the newer developments in the nutrition field.

The nutritive value of the protein of a few South African soybean meals, S. J. MYBURGH (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 19 (1944), No. 1–2, pp. 161–168*).—Following methods described by Mitchell (E. S. R., 51, p. 407), the biological value of raw soybean meal was found to average 49.6 ± 3.092, which was considerably lower than the biological value of 63.3 ± 1.354 found for heated soybean meal. Heating also raised its digestibility from 67 to 71 percent. The net percentage of nitrogen utilization of the heated product was 54.5 as compared with only 39.7 for the raw product. The biological value of another cooked but not baked meal was 55.1 ± 1.945, with digestibility 62 percent. The better palatability and higher protein efficiency indicates that it is advisable to use heated meals. Each test, with the three types of soybean meal, respectively, was conducted with six male rats.

Commercial feeding stuffs, 1943-44, E. R. TOBEY (*Maine Sta. Off. Insp. 192 (1944), pp. 46*).—The guaranteed and found analyses of 318 samples of feeds officially examined in connection with the Maine Feeding Stuffs Law, with definitions (E. S. R., 91, p. 60).

Station initiates new investigations in sheep breeding and management, R. H. WALKER (*Farm and Home Sci. [Utah Sta.], 5 (1944), No. 3, pp. 6–7, illus. 3*).—These investigations are briefly outlined.

Sheep production in Alberta, J. E. BOWSTEAD and J. P. SACKVILLE (*Alberta Univ., Col. Agr. Bul. 19, 4. rev. (1944), pp. 80, illus. 26*).—A revision of the publication previously noted (E. S. R., 61, p. 259).

Some observations on plant versus animal protein supplements for young pigs, B. W. FAIRBANKS, J. L. KRIDER, and D. CATRON. (Univ. Ill.). (*North Amer. Vet., 25 (1944), No. 6, pp. 351–355*).—During the first 13 weeks of an experiment in which pigs confined in dry lot received 11.5 percent of protein, 31 percent died. There were symptoms of anorexia, dermatitis, emaciation, rough hair coat, wobbly gait, and some incoordination. When plant proteins only were fed, there was a death loss during this period of 75 percent. When synthetic thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, and choline were fed in excess of the pigs' requirements, the death loss with the vegetable protein group was reduced to 50 percent. With like supplements to the animal protein ration, the death loss was eliminated. The growth rate with the animal protein was greatly increased, and with the plant protein group it was equal to that produced with the unsupplemented animal proteins. However, the occurrence of dermatitis and some goose-stepping indicated that the ration with the six synthetic vitamins was not nutritionally complete. Supplementing the basal ration with 6 percent dried corn distillers' solubles produced more rapid growth and reduced death losses, but severe incidences of goose-stepping were encountered, particularly in the animal protein lot. Evidently the dried corn distillers' solubles was not so effective in correcting the nutritional deficiencies of the basal rations as the six synthetic vitamins, but the corn distillers' solubles contained growth factors that were deficient in the basal ration. The growth rates were increased and the death losses decreased for pigs on the basal rations by the inclusion of 10 percent alfalfa meal, so that the gains were practically equivalent to the gains on the basal ration with the six synthetic vitamins. When pigs had access to rye pasture during the preweaning period, evidently certain needed factors were stored, enabling the pigs to grow and gain economically during the postweaning period in dry lot, even on a ration not satisfactory for pigs fed continuously in dry lot.

The thiamine requirement of pigs as related to the fat content of the diet, N. R. ELLIS and L. L. MADSEN. (U. S. D. A.) (*Jour. Nutr., 27 (1944), No. 3, pp. 253–262, illus. 2*).—Additional work was conducted to establish the relationship of thiamine intake of the pig (E. S. R., 84, p. 800) to that of dietary fat with rations containing approximately 2, 11, and 28 percent fat. Evidence of thiamine depletion was shown on the lowest level of fat as indicated by failure in appetite and cessation of growth in about 25 days. There was a marked weakening of the heart, decrease in body temperature, emaciation, and other changes. Feeding thiamine to pigs depleted of their stores of this substance usually resulted in prompt response in appetite, growth, and general health. With the intermediate levels of thiamine, the greatest response was produced by the high-fat level, followed in order by the intermediate- and low-fat levels. The maintenance of good health, with the production of maximum gain, required 125 to 141 µg. of thiamine per 100 gm. of carbohydrate and protein, but these levels of thiamine were insufficient to promote storage of normal amounts in commercial pork cuts. The studies were conducted on lots of 1 to 4 pigs with the low-, medium-, and high-fat rations and about 0, 15, 25, 40, and 50 µg. of thiamine per kilogram of body weight for up to about 50 days.

Further investigations on the alleged toxicity of cod-liver oil for pigs, N. J. SCORGIE and W. C. MILLER (*Empire Jour. Expt. Agr., 12 (1944), No. 46, pp. 74–82*).—Toxic liver dystrophy was not produced in groups of 2–15 pigs fed in duplicate with up to 4 oz. per head per day of samples of good and poor cod-liver oil, dogfish-liver oil, or sperm oil between the ages of 20 and 142 days. Evidently pigs were not susceptible to vitamin E dystrophy resulting from destruction by cod-liver oil, as has been reported for herbivorous animals, but there was a marked retardation in growth of 3 of 4 pigs fed 4 oz. of cod-liver oil per head daily. These results were confirmed in histological study. The growth retardation may have been due to the laxative effect.

Studies on the fats of the bacon pig with reference to carcass quality.—I, Iodine value of the back fat under different conditions of feeding, F. B. SHORLAND, R. HANSEN, and K. J. HOGAN (*Empire Jour. Expt. Agr., 12 (1944), No. 46, pp. 103–119, illus. 3*).—The effect of different feeds and restriction of feed on the iodine number of the back fat of Berkshire bacon pigs killed at about 200 lb. live weight was investigated. Pigs from spring and fall litters fed skim milk or buttermilk generally yielded carcasses with firm fats, restriction of the ration having little if any effect on hardness. Addition of 1 lb. of corn meal to a full-fed skim-milk ration or 2 lb. of corn meal to a restricted buttermilk ration had no significant effect on hardness. Addition of 0.75 lb. of corn meal throughout the fattening period caused a significant softening of the carcass. The addition of 1 lb. of copra to a buttermilk ration resulted in a marked lowering in the iodine value of the back fat. A small but significant increase in the iodine number of the back fat was produced by adding 2 lb. of pea meal or 1 oz. of cod-liver oil per day during the winter. In another experiment, feeding 1 oz. of cod-liver oil per day had no effect on the fat hardness. The softest fats were produced on a heavily restricted ration of ground barley, pea meal, and meat meal. The rate of growth affected hardening—the hardest fats were produced with the fastest growth. Improved grading was achieved with restricted diet without detriment to the hardness of the fat of pigs fed on milk unsupplemented. A softer fat was produced on skim milk rations supplemented with corn meal.

Variation in the growth-rate of experimental birds, D. C. HILL, S. J. SLINGER, and I. MOTZOK (*Poultry Sci., 23 (1944), No. 5, pp. 461–463*).—In studies with 19 groups of 17 male and 17 female chicks, with 9 groups receiving one ration and 10 a second ration, wide differences in the feeding value were obtained. It seemed obvious that a group size of 15 to 20 birds was too small to permit a satisfactory measure of the growth-promoting value of different rations.

The stability of D-activated animal sterol when premixed with common poultry feed ingredients, T. T. MILBY and R. B. THOMPSON. (Okla. A. and M. Col.). (*Poultry Sci., 23 (1944), No. 5, pp. 405–407*).—When D-activated animal sterol was remixed with calcium carbonate and stored for 3½ weeks before incorporating it with a turkey starter mash, the tibia ash analysis showed that there was practically complete destruction of vitamin D at the premixed level of 100 units per 100 gm. of feed, and calcification was little better than that obtained without any vitamin D added to the ration. With 200 units of vitamin D per 100 gm. of the ration there was some improvement, but normal calcification was not induced until 400 units of vitamin D stored with calcium carbonate was tested. When D-activated animal sterol was premixed with ground yellow corn, wheat bran, wheat shorts, ground barley, alfalfa leaf meal, meat and bone scraps, cottonseed meal, soybean meal, dried buttermilk, and salt, there was little or no vitamin D destruction as measured by calcification of the tibiae of turkeys at 4 weeks of age.

The effect of the ration upon iris color of Single Comb White Leghorns, R. F. BALL. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 5, pp. 377–385, illus. 1*).—In study of the possible prevention of pigment formation in the iris of fowls, 19 chicks from pullets on a ration deficient in pigment were maintained from hatching to 280 days of age and examined macroscopically at 17-day intervals for the presence of pigment in the iris. There was no color present in the iris at any time, and whole irises mounted in glycerin were pigment-free. Acetone extracts of irises from birds on the pigment-free ration were indistinguishable from pure acetone, but extracts of the irises from two 260-day-old pullets on a color-bearing ration were as yellow as saturated aqueous picric acid. Evidently a pigment-free ration will prevent the deposition of yellow carotenoid pigments in the iris of White Leghorns. Gross examination of the irises of 27 birds from 47 to 141 days of age showed that in growing cockerels and pullets and aged birds the yellow pigment develops in the iris soon after the birds are placed on a pigment-rich ration, but laying pullets do not deposit the yellow pigment in the iris, although healthy nonlaying pullets deposit it. When five 10-week-old Leghorn cockerels with deep bay irises were placed on a pigment-free mash there was a positive fading of the iris color after 86 days and a partial loss of the bay color of the iris after 149 days. Acetone extractions were light in color after 189 days. Birds on pigment-free rations made excellent material for vascularity studies. Certain birds had consistent scores for iris vascularity throughout an 85-day test period. Since ration and vascular system of the iris play such an important role in determining eye color, caution should be exercised in culling of Single-Comb White Leghorns on this basis alone.

Does breed, age, sex, or laying condition affect the pH of the digestive system of chickens? G. D. BUCKNER, W. M. INSKO, JR., and A. H. HENRY. (Ky. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 457–458*).—Determinations of the pH of the liver, bile, pancreas, body fats, and contents and mucosa of the digestive tracts of 1- and 2-year-old White Leghorn and Rhode Island Red cockerels and laying and nonlaying hens in partial molt, full molt, and nonmolt showed them to be the same for corresponding parts of the birds fed the same ration. In general, the pH was about 6 except for the mucosa of the crop, proventriculus, and gizzard. which was about pH 3 to 5.

The effect of "free choice" grain feeding on egg production, feed consumption, body weight, and egg quality, C. E. LEE, J. C. SCHOLES, and C. L. HENRY (*Poultry Sci., 23 (1944), No. 5, pp. 360–370, illus. 2*).—In two series of experiments covering 2 production years, with a total of 2,820 Single-Comb White Leghorn and Rhode Island Red layers, free-choice grain feeding with Leghorns resulted in a significant loss in egg production and net return per bird over feed cost, but no significant differences were demonstrated for Rhode Island Reds. Egg production showed a greater tendency to decline during periods of hot weather in the free-choice grain-fed hens. The Rhode Island Reds used in both years were early hatched, and consequently the laying year terminated in June. Therefore, the full effect of the hot weather was not experienced as with the Leghorns. In the free-choice feeding there was difficulty in getting sufficient mash consumption to maintain production. There was much greater consumption of grain, but mash consumption was reduced by free-choice feeding. About 16 percent protein in the total ration seems necessary for top egg production. No significant differences in egg weight or shell strength resulted from these two methods of feeding. The free-choice-fed Rhode Island Reds exhibited greater variability in yolk color.

The effect of wheat upon the incidence of pullet disease or blue comb, G. D. QUIGLEY. (Md. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 386–391, illus. 1*).—In four lots of 100 New Hampshire pullets each, fed two different scratch grains in conjunction with the same all-purpose mash, it was observed that rate of egg production deteriorated rather rapidly and pullet disease (E. S. R., 89, p. 486) occurred in two of the lots receiving local wheat, but production remained constant in two lots receiving wheat from another source or corn as scratch grain. Neither difference in these wheats in their contents of moisture, fluorine, arsenic, lead, barium, copper, zinc, or selenium, nor differences ascertained by microanalysis explained the results. Evidently the unknown factor in the wheat is either not explained by varietal differences or two or more varieties contain the factor. "The occurrence of pullet disease seems favored by the physiological phenomenon accompanying a moderate to high rate of egg production, and possibly by influences which are seasonal. The true cause of pullet disease continues unknown."

Soybean oil meal in hen rations, G. F. HEUSER and L. C. NORRIS. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 5, pp. 371–376, illus. 1*).—There was no significant difference in egg production or hatchability of eggs in groups of 25 hens receiving one-half, three-fourths, or all of the supplementary protein from soybean meal. Dried whey fed to one-half of the lots had no effect on the egg production. After 30 weeks the feeding was continued for 9 weeks, with crushed wheat replacing the wheat flour middlings and the wheat bran and B-Y feed added to the rations not containing dried whey. Body weight was better maintained in groups receiving some animal protein with bran and flour wheat middlings.

Soybean oil meal in laying rations, E. T. WIGHTMAN, T. D. RUNNELS, and A. H. VAN LANDINGHAM. (W. Va. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 392–395*).—Satisfactory results were obtained from laying rations containing as much as 17 percent of soybean meal and 5 percent of meat scrap. Average egg production of 65.4 and 61.36 percent, respectively, was obtained in 2 lots of 82 birds each in 2 yr., and the weight was maintained. Egg production was about 60 percent in lots on fish meal alone, soybean meal and fish meal, and soybean meal and meat scrap as the protein supplements in a ration consisting mainly of yellow corn, wheat middlings, wheat bran, ground oats, and alfalfa leaf meal. It would seem possible to increase the percentage of soybean meal protein in a laying ration beyond the 50 percent level, which should be useful in the present shortage of animal proteins. The feed consumption on the four rations was comparable.

The value of starfish meal in the poultry starting ration, R. E. MORSE, F. P. GRIFFITHS, and R. T. PARKHURST. (Mass. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 408–412*).—Starfish meal compared favorably with fish meal and meat scrap in feed efficiency and production of shank pigment. The average weight at 8 weeks of age of Rhode Island Red chicks receiving the New England College Conference chick ration containing 2.5 percent fish meal and 2.5 percent meat scrap was 817.5 gm. as contrasted with 776.2 and 777.5 gm. for those receiving 4 percent crab meal and 4 percent starfish meal, respectively, in place of the fish meal. When 8 percent starfish meal was fed in place of both the fish meal and the meat scrap, the average weight at 8 weeks of age was 781.6 gm. Evidently starfish meal contained as much riboflavin as fish meal, but probably less of the nutritive factors which prevent poor feathering and dermatosis of the feet. The study was based on 4 lots of 40 Rhode Island Red chicks each.

Starfish meal as a protein substitute in chick rations, H. O. STUART and C. P. HART (*Rhode Island Sta. Misc. Pub., 21 (1944), pp. 5+*).—Ground air-dried starfish meal, furnishing about 4 percent of the ration of chicks, produced an average weight of 3.09 lb. in 12 weeks as contrasted with 3.04 lb. on a chick ration which included somewhat more fish meal with yellow corn meal. Analyses of the tibiae on a fat-free and moisture-free basis showed increases in the calcium, phosphorus, and ash contents of birds on the starfish meal ration. The comparative trial was conducted with 100 day-old chicks divided into 2 lots.

The use of a hoof and horn meal to replace animal and vegetable protein in rations for growing chicks, S. J. SLINGER, E. V. EVANS, W. I. KELLAM, and F. N. MARCELLUS (*Poultry Sci., 23 (1944), No. 5, pp. 431–436, illus. 2*).—Hoof and horn powder proved to be a fairly adequate substitute for all the meat meal (5 percent) in rations containing 5 percent of fish meal and 3 percent of buttermilk powder as additional sources of animal protein. In the absence of fish meal, hoof and horn meal proved entirely unsatisfactory as a meat-meal substitute, and it proved decidedly inadequate as a substitute for fish meal even in the presence of meat meal and buttermilk powder. Either fish meal and hoof and horn meal contain distinctly different amino acids or those in both products are not available to the chick in hoof and horn meal. The average weights of chicks at 10 weeks of age on a basal ration of plant feeds and plant and animal proteins totaling about 18 percent protein was 952 gm. Equal weights were attained when hoof and horn meal replaced two-thirds of the buttermilk, and nearly equal weights when all the buttermilk powder or meat meal was replaced. Poorer weights at 10 weeks of age were produced when hoof and horn meal replaced all the fish meal or part of the fish meal and meat meal or all of the animal protein. Weight at 10 weeks of age on a ration including 8 percent hoof and horn meal was improved when one-half of the hoof and horn meal was replaced by linseed meal, sunflower seed meal, or soybean meal or when all of the hoof and horn meal was replaced by corn gluten feed or sunflower seed meal. There was no indication that hoof and horn meal exhibited any supplemental effect when fed in combination with any one of the vegetable protein materials. In general, corn gluten feed, sunflower seed meal, or soybean meal—and probably linseed meal below the toxic level—were markedly superior to hoof and horn meal. The study was conducted over 10 weeks with 18 lots of 35 Barred Plymouth Rock × White Leghorn chicks each.

Feeding the new crop of pullet layers, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 238–242*).—Emphasis is placed on the need for care in preparing rations for pullets moved into the laying house after being accustomed to green feed and sunshine. The consumption of mash as a source of protein, minerals, and vitamins was found to be especially important. A group of Rhode Island Red pullets on a ration of whole oats and a mash mixture with bran and middlings produced an average of 145 eggs and required 9.53 lb. of feed per dozen eggs in 50 weeks. Another lot receiving ground wheat in place of bran and middlings produced an average of 129 eggs and required 10.21 lb. of feed per dozen eggs. The egg production was less and the feed consumption per dozen eggs greater with rations of 24 percent protein mash and free choice of corn and oats or free choice of corn, oats, and wheat. Attention is called to the greater preference for wheat over the other grains fed free choice. Suitable calcium supplements may be furnished with free choice of oystershells or other shell materials high in calcium and limestone. Dolomitic magnesia limestone grit not only reduced egg production but caused many of the eggs to have thin or weak shells.

Dried coffee grounds unsuitable for use in the diet of growing chickens, J. C. Hammond. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 5, pp. 454–455*).—In an experiment in which 25, 15, 7.5, and 0 percent of the yellow corn in a mash including several feeds was replaced by dried coffee grounds, the average weights of chicks were, respectively, 106.5, 161.4, 187.2, and 251.7 gm. at 4 weeks of age. In a second experiment in which chicks received rations containing 5 and 10 percent, respectively, of ground oat hulls, the weights at 6 weeks of age averaged 402.4 and 429.6 gm., whereas chicks receiving 5 and 10 percent coffee grounds averaged 348.6 and 260.8 gm., respectively. It seemed evident from these two experiments that coffee grounds exerted a far more deleterious effect on the growth of chicks than can be attributed to dilution of the ration, and, therefore, coffee grounds are considered unsuitable for use in the ration of chicks. There were 4 lots of 25 Rhode Island Red chicks in each of the two experiments.

The effect of feeding sulfanilamide to the laying fowl, H. M. Scott, E. Jungherr, and L. D. Matterson. ([Conn.] Storrs Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 446–453, illus. 4*).—Because of the possible retarding effect of sulfanilamide on experimentally induced fowl paralysis, the effects of varying doses of sulfanilamide on the eggs produced by groups of 3 to 5 Rhode Island Red or Barred Plymouth Rock pullets were investigated in six experiments. In general, the pullets were confined to individual compartments of a laying battery. The eggs laid in about 10 days before experimental treatment and about 7 days after treatment were examined for shell texture, shell thickness, and shell weight. Apparently the laying fowl can tolerate as much as 0.03 percent sulfamilamide in the total ration and continue to lay, but egg production was almost completely inhibited at 0.5- and 0.25-percent levels. Intermediate levels decreased rate of production. A single large dose of 2.5 gr. per pound live weight disturbed the rhythm of laying. Sulfanilamide caused a thinning of the eggshell, a roughened shell surface, and a decrease in shell pigment. The quality of the shell was immediately affected on the second day from doses of 0.5 to 0.008 percent sulfanilamide added to the ration. Macroscopically, shell texture was normal on the second day following sulfanilamide withdrawal, but the original shell thickness was not attained until after 4 to 5 days had elapsed. The shell texture was normal with 0.004 to 0.002 percent of the drug, but shell thickness decreased. The level of calcium in the blood was not altered by sulfanilamide feeding. The toxicity of sulfanilamide was not alleviated by fortifying the rations with fish oil, calcium carbonate, casein, yeast, manganese, stilbestrol, KI, $Fe_2(SO_4)_3$, and $CuSO_4$. The physiological effects of sulfanilamide were not caused solely by premature expulsion from the egg, resulting in thin eggshell in at least part of the pullet eggs, but also from an inhibition exerted on the secretory ability of shell glands.

Interrelation of methionine, choline, betaine, and arsenocholine in the chick, H. J. Almquist and C. R. Grau. (Univ. Calif.). (*Jour. Nutr., 27 (1944), No. 3, pp. 263–269*).—On continuing previous studies (E. S. R., 92, p. 102), a growth-promoting action of betaine and methionine which becomes conspicuous under conditions of choline deficiency was noted in the chick. With arsenocholine the substitution for choline was nearly complete. Varying amounts of these materials were added as supplements to the basal ration of lots of 3 to 4 chicks fed for 1 week, with the daily percentage of gain in weight recorded.

Ashing of egg whites and yolks and the determination of their iron content, S. L. Bandemer, J. A. Davidson, and P. J. Schaible. (Mich. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 437–440*).—Foaming out of the crucible and fusion of the ash of egg white were found to add difficulties to the determination of iron in egg white. These difficulties were attributed to the high phosphorus content of the white relative to its content of the base, because when various phosphorus compounds were added to iron solutions in the proportion found in egg white the ash fused and the iron was not completely recovered. When magnesium chloride was added before ashing, no fusion occurred and iron was completely recovered. No difficulties were encountered in ashing small samples of egg yolk, but folded filter paper in the crucible was found advantageous for larger samples of egg yolk.

A field survey of ranch egg quality, F. W. LORENZ and W. E. NEWLON. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 5, pp. 418–430, illus. 2*).—In a survey of the quality of eggs produced on 38 ranches in 5 counties of California, it was found that quality as measured by albumen height deteriorated more than was shown by the estimate obtained by candling. The greatest loss in albumen quality occurred during the first 24 hr. after the eggs were laid, and important losses also occurred during the remainder of the time on the ranch, but there was little or no additional loss during delivery to the receiving station. The market albumen quality was influenced before the eggs were laid and during the first 24 hr. following laying, as well as the remainder of the time on the ranch. Egg cooling practices and frequency of delivery were important factors in summer but of little importance in winter. Better albumen quality was shown in pullet eggs than in eggs from hens. Seasonal loss in albumen quality was probably due in part to increased age of the flock. The survey was based on 2½ doz. eggs from each ranch, 1 doz. being from the freshest to leave the ranch and 1 doz. from the oldest eggs collected. Albumen height was ascertained by measurements with a tripod micrometer, as indicated by Wilgus and Van Wagenen (E. S. R., 76, p. 379), and yolk color records.

Influence of temperature on changes in storage eggs measured by radio-frequency conductivity, A. L. ROMANOFF and G. O. HALL. ([N. Y.] Cornell Expt. Sta.). (*Ice and Refrig., 107 (1944), No. 3, pp. 50–51, illus. 1*).—The radio-frequency conductivity of hen's eggs (E. S. R., 86, p. 315) was found to increase with age during storage at different temperatures with relative humidity of about 55 percent. The increase was very rapid at 69.8° F., relatively slow at 41°, and intermediate at 55.4°. The quality of the eggs was related to the radio-frequency conductivity, and its use for quality studies is suggested. Six eggs stored at each of the temperatures were measured each week over a 10-week period for relative conductivity at a frequency of about 12 mc.

Cow manure as an ingredient of turkey diets, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 5, pp. 358–359*).—Cow manure, fresh or dried, was an excellent substitute for alfalfa leaf meal in the rations of poults. Five lots of 20 poults each were given 90 percent of a basal ration of cereals and protein supplements with 10 percent of alfalfa meal or cow manure. A variance analysis of live weights at 4, 6, and 8 weeks of age showed no significant differences. The cow manure samples were fed fresh or after drying approximately 24 hr. at 47°, 80°, and 120° C. Livability, growth rate, and efficiency of feed utilization were unimpaired by the use of cow manure, as was previously indicated with chickens (E. S. R., 88, p. 518).

The influence of diethylstilbestrol on fat deposition in turkeys, F. W. LORENZ. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 5, pp. 458–459*).—Study of the effects of implanting 3 diethylstilbestrol pellets in turkeys at 110 to 166 days of age on the fat observed 30 to 90 days later showed that the treatment caused a distinct increase in abdominal fatty tissue, but the results were not as striking in proportion to body weight as were those observed with cockerels (E. S. R., 89, p. 245). Maximum increase with reference to body size was attained at 44 days after implantation.

The bursa of Fabricius in ring-necked pheasants, C. M. KIRKPATRICK. (Ind. Expt. Sta.). (*Jour. Wildlife Mangt., 8 (1944), No. 2, pp. 118–129, illus. 11*).—

The bursa of Fabricius was studied in three farm flocks of game pheasants hatched on May 20, 1941, and May 27 and July 5, 1942, respectively. Involution of the bursa proceeds from September until late April, when most of the bursae can no longer be measured. The average depth of the bursa was ascertained by measurement with an instrument devised from a medicine dropper of Pyrex glass tubing, which was closed, sealed, rounded at the end, and calibrated. The average depth of bursa of birds hatched at different dates was influenced by the year of hatching. The bursa depth of the younger pheasants in the autumn indicated that hatching date was important. The presence of bursa was a positive indication of juvenile birds.

DAIRY FARMING—DAIRYING

Further studies on bloat, S. W. Mead, H. H. Cole, and W. M. Regan. (Univ. Calif.). (*Jour. Dairy Sci., 27 (1944), No. 9, pp. 779–791*).—According to data obtained from experiments supplementing several studies on bloat (E. S. R., 91, p. 67) and earlier investigations, 21 mild cases of bloat were produced in four cows over a 15-day period by feeding ground alfalfa hay and concentrates in a 60 : 40 ratio, but only 1 case of bloat occurred when the ground alfalfa and concentrates were fed in equal parts. It was interesting to find that 12 cases of bloat were produced in four of six cows which were fed green alfalfa tops in the barn for 9 days. Bloat was not prevented by feeding barley straw at night to cows pastured on alfalfa during the day. Individual variations occurred in the susceptibility to bloat which could not be explained by the amount, kind, or character of the feed consumed. Physiological activity of the rumen seemed the most likely explanation. Bloating was most prevalent in cows receiving grain just before turning on pasture. Lactating cows were more susceptible than dry cows. The average amount of alfalfa consumed by a dry cow during the first 2 hr. of pasturing in a 12-day period was 19.4 lb. as compared with 43 lb. for a milking cow. The consumption of alfalfa by the dry cow was markedly increased by feeding barley straw overnight before pasturing, but the effect on the milking cow was less conspicuous. Feeding concentrates just before pasturing decreased consumption of alfalfa of dry cows without effect on the incidence of severity of bloat. These conclusions were based on a series of experiments involving an average of nine cows fed for 61 days in which 194 cases of bloat developed.

Oestrogen treatment of cattle: Induced lactation and other effects, J. Hammond, Jr., and F. T. Day (*Jour. Endocrinol., 4 (1944), No. 1, pp. 53–82, illus. 5*). Observations were made on ovarian changes, reproductive tract, udder, and behavior of 140 cows and heifers on private farms in eastern England which had failed to get in calf and were treated with implants of stilbestrol or hexestrol tablets. Follicle growth ceased during the treatment and occasionally the corpus luteum persisted. After removal of the implant, follicular growth began and ovulation was resumed, with an increase in the frequency of double ovulations being noted. Irregular heat occurred after corpora lutea degenerated, and repeated jumping frequently resulted in a fractured pelvis. A number of nonbreeding heifers which were physically normal were gotten in calf following the estrogen implantations. Implants assisted the drying off of lactation and its initiation in cows and heifers. The development of secretion was suppressed in the presence of a persistent corpus luteum. The rates of tablet absorption were discussed.

Oestrogen excretion in milk from oestrogenized cattle, W. Lawson, S. W. Stroud, and P. C. Williams (*Jour. Endocrinol., 4 (1944), No. 1, pp. 83–89*).—Samples of milk, urine, and blood from cows which had been previously treated with estrogen were analyzed for the presence of estrogen. Small amounts of hexestrol added to normal milk were extracted with 60 to 100 percent recovery, but the amount present in the milk of heifers treated with synthetic estrogens was too small for assay by direct feeding to rats. Small amounts of estrogen were detected in the milk of treated animals by subcutaneous injection or intravaginal application in ovariectomized rats. Single determinations on the blood and urine of a heifer receiving orally 20–24 mg. of dienestrol daily gave dienestrol concentrations of 5 µg. per liter of blood and 2 mg. per liter of urine.

The artificial induction of lactation in the bovine by the subcutaneous implantation of synthetic oestrogen tablets, S. J. Folley and F. H. Malpress (*Jour. Endocrinol., 4 (1944), No. 1, pp. 1–18, illus. 7*).—The subcutaneous implantation of large numbers of small tablets of diethylstilbestrol or hexestrol induced lactation in nulliparous heifers and dry cows. Individual variations in the responses were large, but in some cases the lactation curve was comparable to that of normal lactation, the best response with a dry cow being 30.25 lb. per day and a total yield of 7,400 lb. of milk. The implantation of 2.5 or 5 gm. of either of the two hormones was equally effective. Diethylstilbestrol was absorbed more rapidly than hexestrol. In most cases the estrogen treatment was accompanied by a nymphomaniac syndrome which in 20 percent of the experiments with implantation of small tablets culminated in pelvic fracture. There were used in the main experiments of induced lactation 19 heifers, 9 dry cows, and 2 freemartins, which included the implantation of large numbers of 25- and 15-mg. tablets of both hormones. In addition, 5 heifers and 5 cows were implanted with large hexestrol tablets. The duration of the treatments lasted from about 45 days to over 100 days.

Fracture of the pelvic bones in bovines implanted with tablets of synthetic oestrogens, A. T. Cowie (*Jour. Endocrinol., 4 (1944), No. 1, pp. 19–22, illus. 3*). —Fracture of the pelvis of seven of the cows and heifers in the above study is noted, and it is suggested that fractures in nymphomania results from coital mimicry. Estrogen may either cause alteration in structure or chemical composition or in the angular relationships between bones, placing them in positions less favorable for withstanding stresses and strains.

Artificial induction of lactation in bovines by oral administration of synthetic oestrogens, S. J. Folley and F. H. Malpress (*Jour. Endocrinol., 4 (1944), No. 1, pp. 23–36, illus. 7*).—In experiments with about 40 heifers, lactation was induced in 19 of 32 of them by feeding diethylbestrol or dienestrol. The response was at a markedly lower level than in the above paper, in which the hormones were administered by implantation. The milk yields were generally inferior, and far more estrogen was needed to evoke response. The animals did not suffer in condition from the treatment, and nymphomaniac effects were not pronounced, although two serious cases of vaginal and rectal prolapse were encountered. It was estimated that less than 10 percent of the dose given was utilized. Relation of the response to the age factor is discussed.

The chemical composition of bovine mammary secretions induced by the subcutaneous implantation or oral administration of synthetic oestrogens, S. J. Folley and F. H. Malpress (*Jour. Endocrinol., 4 (1944), No. 1, pp. 37–42*).—Changes in the composition of milk artificially induced by synthetic estrogens implanted or administered orally in the above studies showed that the earliest secretions were invariably colostral in general character and were characterized by high solids-not-fat and low fat percentages. The total nitrogen values and nitrogen distribution were at first typical of colostrum, but the composition changed to that characteristic of normal milk. The data include milk yield, percentage of fat, solids-not-fat, total nitrogen, casein nitrogen, nonprotein nitrogen, casein number, lactose, and chlorine at intervals up to about 100 days after implantation or feeding the estrogen.

Induction of lactation in heifers by a single injection of esters of diethylstilboestrol, A. S. PARKES and R. E. GLOVER (*Jour. Endocrinol., 4 (1944), No. 1, pp. 90–102, illus. 3*).—In studying the effect of single injections of esters of stilbestrol or combinations of the esters into nonmilking heifers, lactation was generally induced. The best yield, 13 lb. daily, was obtained from a heifer injected with 0.25 gm. of dilaurate and 0.25 gm. of dipropionate. The simultaneous injection seemed most appropriate for combinations of slowly and rapidly acting esters. This combination of esters, given as a single injection, induced lactation as effectively as the implantation of tablets of diethylstilbestrol or hexestrol. There were employed in this study 3 lots of 7, 10, and 7 heifers, respectively, treated with one or more esters of diethylstilbestrol—dipropionate, di-*n*-butyrate, dicaprylate, dicaprate, dilaurate, and dipalmitate, with dosages varying from 0.05 to 1.0 gm., in terms of the molecular equivalent of free stilbestrol.

Experiments on the use of tablets containing 50 percent hexoestrol for the artificial induction of lactation in the bovine, S. J. FOLLEY, D. L. STEWART, and and F. G. YOUNG (*Jour. Endocrinol., 4 (1944), No. 1, pp. 43–52, illus. 3*).—Large individual variations in the responses of eight unbred South Devon heifers and two dry cows in milk yields resulted from the subcutaneous implantation of tablets of 50 and 250 mg. in weight containing 50 percent hexestrol, 49 percent lactose, and 1 percent stearic acid. Satisfactory responses were produced in two heifers and one dry cow. The responses of the other six heifers to implants of pure hexestrol tablets were also variable. Symptoms of nymphomania were observed, but no pelvic fractures occurred. Of the six animals retained for breeding, five became pregnant on first mating. All calves were males, two of which were born dead and another prematurely. Tablets containing 50 percent hexestrol tended to become absorbed more slowly than pure hexestrol tablets of comparable size.

Non-permeability of the mammary gland to thyroid hormone, E. P. REINEKE and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 9, pp. 793–805, illus. 4*).—The mammary glands of cows did not permit the passage of biologically detectable amounts of thyroidal hormone when Protamone (E. S. R., 91, p. 672) was fed as a portion of the ration, although this product increased milk production. Guinea pigs were given approximately 100 cc. of milk daily for 2 weeks without increasing the metabolic rate and with only a very slight increase in a second experiment. A 25 percent increase in metabolism was induced in the guinea pigs by injections of 2.5 μg. of *l*-thyroxine per day. In a similar experiment with thyroidectomized goats, no metabolic improvement could be detected as a result of feeding milk from the cows fed Protamone for 2 weeks. The guinea pigs, however, responded when 0.25 gm. of Protamone was fed directly to them each day. No elevation in the basal metabolism of two humans could be detected when they consumed a quart of milk a day from the Protamone cows, but there were significant elevations in the basal metabolic rate when 0.5 to 1 gr. of Protamone daily was fed directly to them.

A note regarding the speeds of Babcock centrifuges, B. L. HERRINGTON. (Cornell Univ.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 857–859*).—A new table to produce equal forces at the fat and acid interface during the first centrifuging period is suggested, and it is recommended that the use of small diameter centrifuges be discontinued because the force acting to remove water emulsified in the fat column is very small in the small machines. Speeds which yield equal forces 1.5 in. above the bottom of the centrifuge cups, depending on the diameter, should be employed.

A breed comparison in the vitamin D content of milk with notes on a modified technique for the vitamin D assay of low-potency fats and oils, G. C. WALLIS. (S. Dak. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 9, pp. 733–742*).—Three Holstein and three Jersey cows were studied as to the vitamin D secretion when receiving per day 19,000, 6,500, and 24,220 International Units of vitamin D from alfalfa hay (E. S. R., 91, p. 726). The Jersey butterfat contained somewhat more vitamin D per gram than the Holstein butterfat on the same ration. About 1.5 percent of the ingested vitamin D was recovered during the early lactation, but only about 0.5 percent near the end of lactation for both breeds. The vitamin D content of the blood plasma from Jerseys in the third pair was higher than for the Holsteins. Several fats—butterfat, cooking fat, olive oil, and cooking oil—in vitamin D assays with rats showed that all exerted some healing effect when fed with the rachitogenic diet, but lower and more accurate values were obtained for the vitamin D content of low butterfat samples by the use of a ration having calcium carbonate, salt, and other feeds added.

Isolation from milk supplies of specific types of green-producing (alpha) streptococci and their thermal death point in milk, E. C. Rosenow (*Minn. Med., 27 (1944), Nos. 6, pp. 469–474, illus. 1; 7, pp. 550–556*).—Report is given of a study of the virulence, cataphoretic velocity, serologic properties, and heat resistance of green-producing or alpha streptococci isolated from milk supplies during epidemics and remote from epidemics and the pasteurization temperature that invariably kills virulent alpha streptococci commonly found in milk. It was found that epidemic strains isolated from patients grew at a higher dilution in brain-containing media than nonepidemic strains or saprophytic organisms. Virulent strains and pathogenic organisms often grew in milk at usual refrigeration temperatures and at higher dilutions in dextrose brain broth and agar than streptococci found in milk supplies remote from epidemics. Those present in milk during epidemics were unusually resistant to heat, often remaining viable after pasteurization for 30 min. at 145.4° F. in the laboratory. The high heat resistance disappeared on artificial cultivation. The relationship of this organism to *Streptococcus durans* (E. S. R., 77, p. 535) and *S. zymogenes* isolated from pasteurized milk by Sherman and Wing was not ascertained.

"Clinical and experimental evidence obtained indicates (1) that raw, and less often pasteurized, milk supplies shown to contain alpha streptococci true to type are probable sources of infection; (2) that during epidemics the streptococci normally present in respiratory and intestinal tracts of persons and broadly present in nature, including milk, acquire virulence and other properties characteristic of the streptococci associated with the respective epidemics; (3) that the incidence of diseases resulting from acquired specific virulence of the streptococci is increased by the drinking of milk containing the specifically virulent organisms. . . . Pasteurization of milk by the holding and flash methods, as now practiced, while apparently adequate to kill beta streptococci, nonvirulent alpha streptococci, and other pathogenic organisms commonly present in raw milk, has been found inadequate to kill specifically virulent alpha streptococci commonly present in milk supplies during epidemics of encephalitis, poliomyelitis, respiratory infections, influenza, and hiccup." More efficient methods are needed. It is suggested that milk be pasteurized routinely at 163.4° for 30 min., at least during epidemics.

Seasonal and geographical variations in the citric acid content of defatted milk solids, B. Heinemann (*Jour. Dairy Sci., 27 (1944), No. 9, pp. 773–777, illus. 1*).—Study of 27 samples taken throughout the year showed a small but definite seasonal variation in the citric acid content of defatted milk solids ranging from a maximum of 2.09 percent in March and April to a minimum of 1.88 percent in November. Study of milk from 11 different States indicated a slight variation in milk from different localities.

The survival of E. typhosa in Cheddar cheese manufactured from infected raw milk, A. G. Campbell and J. Gibbard (*Canad. Jour. Pub. Health, 35 (1944), No. 4, pp. 158–164, illus. 1*).—In this study 14 vats of milk were processed, yielding two 10- to 12-lb. cheeses each, and all except 3 control vats were inoculated just prior to the addition of rennet with three different type cultures of *Eberthella typhosa* sufficient to produce counts of 1,000 to 600,000 per cubic centimeter. The newly formed cheeses were hooped and pressed and one-half of them stored at 58°–60° F., and the other half were stored at 40°–42°. As the cheese aged the number of viable *E. typhosa* fell off rapidly. The cheeses were graded after 8 mo. following manufacture, and of the 20 cheeses 8 were below third, 10 in third, and 2 in second grade for flavor; 5 were below third, 1 in third, 9 in second, and 5 in first grade for texture. There was a significant difference in the viability of *E. typhosa* in cheese stored at the two temperatures. At the lower temperature 7 of 10 cheeses retained the viability more than 300 days, but most of the *E. typhosa* were dead in cheese stored at 58°–60° after 3 mo. There did not seem to be any correlation between acidity of the cheese and viability of the bacteria.

Factors involved in the production of high quality sherbets and ices, W. J. CAULFIELD and W. H. MARTIN. (Kans. Expt. Sta.). (*Ice Cream Rev., 27 (1944), No. 12, pp. 24–25, 64; 28 (1944), No. 1, pp. 24–25, 70–76*).—Attention is called to the lack of uniformity in the composition of sherbets, with a suggested proof table for composition. Important in the quality of sherbet is the sugar content, which may be provided from various sweetening agents. High sugar content and high overrun make for a soft product. Stabilizers are even more important with ices and sherbets than with ice cream. The method of determining the amount of gelatin for stabilization is described, and a table is given showing the minimum concentration of gelatin of different bloom strengths required to form a gel with skim milk and with water acidified to 0.45 percent acid expressed as citric acid. Each 5 percent increase in sugar should be accompanied by an increase of 0.04 percent in the citric acid content. Milk solids for sherbets may be provided from skim milk, whey, and ice cream mix. Additional solids could be provided from wheat and oat flour. Color and flavor are important.

Now, it's ice cream from sweet potatoes, A. D. BURKE. (Ala. Polytech. Inst.). (*Ice Cream Trade Jour., 40 (1944), No. 7, pp. 22, 62–63, illus. 1*).—Attention is called to the success obtained in the use of 2 percent alamalt (E. S. R., 91, p. 740) from sweetpotatoes in the manufacture of ice cream.

VETERINARY MEDICINE

A veterinary economic survey, E. J. FRICK and D. R. HANEY. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 810, pp. 140–141*).—Results of an attempt to evaluate veterinary service in dollars by an analysis of 7,113 cases treated by nine veterinarians in Oklahoma, Missouri, Nebraska, and Kansas during October 1943 are reported in tabular form. An indicated gain of $7.10 for each $1.00 spent for veterinary service is estimated.

[Miscellaneous case reports] (*Cornell Vet., 34 (1944), No. 3, pp. 262–266, illus. 1*).—These cases deal with Diaphragmatic Hernia in a Pig, by K. S. Harmon (pp. 262–264) (Okla. A. and M. Col.); and Nephritis in a Bull and Its Effect on Reproduction, by J. W. Britton (pp. 264–266) (Univ. Calif.).

The effect of stilbestrol on experimental streptococcal infection in mice, G. E. FOLEY and W. L. AYCOCK (*Endocrinology, 35 (1944), No. 3, pp. 139–145, illus. 1*).—A single dose of 40–50 roentgen units of stilbestrol rendered mice highly resistant to a dose of mouse virulent hemolytic streptococci which regularly killed normal control mice of the same age and sex. This protective action was of 8 to 10 days' duration. The results of post-mortem bacteriological examination suggest that protection was afforded by some stilbestrol-induced factor which interfered with the spread of hemolytic streptococci in mice. "This experiment is another example which illustrates the importance of host rather than parasitic variation in determining disease upon exposure to the infectious agent."

The cultivation of human tubercle bacilli on egg mediums, D. M. Powelson and J. R. McCarter. (Wis. Expt. Sta.). (*Jour. Infect. Diseases, 75 (1944), No. 1, pp. 95–101*).—In the light of the present knowledge, of all the mediums examined in this investigation Hohn's medium containing glycerin and dye and at pH 7.0 seems to be the one of choice for routine cultivation of clinical specimens.

Undulant fever caused by Brucella abortus strain 19, H. L. Gilman. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 3, pp. 193–194*).—In a case of a student vaccinating a calf for brucellosis with a slip-type syringe, several drops of *B. abortus* strain 19 were sprayed into an eye. Although washed out at once, symptoms diagnosed as brucellosis developed 16 days later and successful isolations of *Brucella* organisms were obtained a week later. Recovery was rapid after sulfadiazine therapy was begun, and cultures made 3 days later all remained sterile. It is concluded that strain 19 is capable of infecting man under certain conditions, and that greater care in handling the vaccine is indicated.

Broadleaf milkweed poisoning, C. M. Baxter (*Cornell Vet., 34 (1944), No. 3, pp. 256–259*).—Case reports of two horses and four goats showed fatal results from the ingestion of small amounts of the stems and leaves of *Asclepias* sp. The symptoms in horses are described as easily confused with those of equine encephalomyelitis.

The toxicity of Kallstroemia hirsutissima (carpet weed) for cattle, sheep, and goats, F. P. Mathews. (Tex. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 810, pp. 152–155, illus. 4*).—Cattle losses near Balmorhea, Tex., which were considered to be due to the grazing of *K. hirsutissima,* a very common plant in this region, are reported. Feeding it to one heifer produced inconclusive results, but it was found to be toxic to sheep and goats.

A suspected case of trematol or white snake root poisoning, S. J. Roberts and C. S. Haller. (Cornell Univ.), (*Cornell Vet., 34 (1944), No. 3, pp. 266–269*).—A case terminating fatally but not definitely diagnosed as trembles or trematol poisoning, since white snakeroot (*Eupatorium urticaefolium*) was not found, is noted in a 5-year-old Guernsey cow.

Distension as a factor in gastro-intestinal diseases of herbivores, J. W. Britton. (Univ. Calif.). (*Cornell Vet., 34 (1944), No. 3, pp. 227–234*).—Evidence is presented to dispute the claim that so-called enterotoxemia of ruminants is due to the absorption of type D *Clostridium welchii* toxin from the intestine. The importance of bowel atony and intestinal distension in enterotoxemia is stressed and compared with similar lesions in inhibitory ileus of man and grass sickness of horses. On the basis of these findings, the author believes that the etiology of enterotoxemia needs further study and clarification, with special reference to factors other than the bacteriology.

Preliminary note on the administration of nonconditioned phenothiazine, in small daily doses, for the control of gastrointestinal parasites of cattle in Puerto Rico, J. S. Andrews, C. M. Muñiz, and F. Orihuela (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 27 (1943), No. 3, pp. 125–130, illus. 1*).—The experiments showed that daily doses of 0.5 gm. of nonconditioned phenothiazine per 100 lb. of live weight administered to cattle infected with gastrointestinal parasites reduced the number of worm eggs passed into the pasture by the infected animals. The eggs of the stomach worms *Haemonchus contortus* and *H. similis,* the small intestinal hairworm *Trichostrongylus* spp., the hookworm *Bunostomum phlebotomum,* and the nodular worm *Oesophagostomum radiatum* disappeared relatively quickly from the feces of the treated animals, but the eggs of *Cooperia* spp., *Strongyloides papillosus,* and the broad tapeworms *Moniezia* spp. were not markedly reduced in number by this treatment. The results confirmed those of Porter, Simms, and Cauthen (E. S. R., 86, p. 250) showing that phenothiazine has little effect on the last three parasites mentioned. The dose rate used in these experiments compared favorably with that suggested by Shorb and Habermann (E. S. R., 84, p. 105) for the prevention of the development of nematode larvae in the feces of sheep.

Acetonemia: Observations of "vitamin A" therapy, A. C. BURT (*Canad. Jour. Compar. Med. and Vet. Sci., 8 (1944), No. 7, pp. 187–188*).—Recent observations on about 18 cases of acetonemia are discussed, the results indicating that vitamin A is the most satisfactory treatment.

The chematherapy of 275 cases of anaplasmosis, H. C. SMITH and D. E. HOWELL. (Okla. Expt. Sta.). (*Vet. Med., 39 (1944), No. 10, pp. 377–387, illus. 9*).—In tests carried out on a large ranch, "neosalvarsan, tryparsamide, cobalt chloride, and sodium sulfathiazole, each in combination with large amounts of dextrose, gave the most promising results. Satisfactory results were obtained, also, by the use of sodium cacodylate alone and in combination with dextrose and by aricyl alone and in combination with dextrose. Calcium gluconate, formalin, cobalt sulfate, and sodium iodide in the combination with dextrose did not give desirable results." It is emphasized that these conclusions are only tentative.

Agglutinative tests and allergic skin tests on a herd with chronic brucellosis, I. LIVE, E. L. STUBBS, and M. R. GARDINER, JR. (*North Amer. Vet., 25 (1944), No. 8, pp. 468–475*).—In this comparison of tests of 63 cows with brucellosis of long standing, 41 were still positive, 18 suspicious, and 4 negative to the agglutination test for brucellosis 4 to 9 yr. after they had been designated as reactors in official blood testing. However, by means of the intracutaneous test with sonic filtrate of *Brucella abortus,* 51 animals were found positive, and the combined results of the serological and allergic tests showed 61 of the cows as reacting to one of the two tests or to both.

Of 54 cows which had negative or suspicious agglutination titers at the time they were added to the infected herd 2 to 5 yr. previous to the study, 35 animals were positive, 7 suspicious, and 12 negative to the agglutination test at the time of the experiments. On the other hand, 47 cows reacted to the intracutaneous test, and, by combining the results of the two reactions, 49 of the 54 animals were found positive to one of the two tests or to both.

Cows with suspicious or negative agglutination titers and positive skin reactions had, with few exceptions, aborted or suffered from retained placenta following some of the parturitions. Milk cultures for *B. abortus* from 89 of the animals were positive in nine cases, and on cultures of tissues from 54 of the cows *B. abortus* was isolated from the supramammary lymph gland in three instances.

The causes of outbreaks of bovine coccidiosis, D. C. BOUGHTON. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 809, pp. 74–77*).—The author compares the exacerbation hypothesis of Marsh (E. S. R., 79, p. 109) with what he terms "the concentration hypothesis," in which overcrowding of susceptible hosts is considered the precipitating factor. He concludes that "until data are presented in support of the several assumptions upon which the exacerbation hypothesis is based, the concentration hypothesis should remain the logical basis for practical approach to the problems involved in outbreaks of clinical coccidiosis in cattle."

Hexachloroethane treatment of liver fluke in Oregon cattle, J. N. SHAW (*Oregon Sta. Tech. Bul. 7 (1944), pp. 11, illus. 12*).—Treatment with 10 gm. per 100 lb. body weight of the hexachloroethane-bentonite mixture recommended by Olsen (E. S. R., 89, p. 363) did not prove successful in destroying liver fluke in one of two steers treated, but livers of treated animals were found in better condition for salvage than untreated livers. Untreated infested animals made practically the same gains as treated infested animals.

Fluke eggs were present in the gall bladder of treated animals as long as 4 mo. after treatment, but efficacy of treatment could not be determined by egg counts. Calcareous incrustations were not entirely absorbed in treated animals.

Physical examination of the udder in the diagnosis of chronic bovine mastitis, J. M. MURPHY, D. H. UDALL, S. D. JOHNSON, and L. J. TOMPKINS. (N. J. Expt. Stas. coop. Cornell Univ. et al.). (*Cornell Vet., 34 (1944), No. 1, pp. 1–12*).—This study of diagnostic methods deals with physical examinations made in the herd of the New Jersey Dairy Research Station by the Udall system (E. S. R., 70, p. 680).

"Direct comparison of the physical examination status with the presence of streptococcal infection showed that 72.8 percent of No. 4 udders, 33.2 percent of No. 3 udders, and 5.2 percent of No. 2 udders were infected with streptococci. Inasmuch as more than half the udders were classed as No. 3, but only 33.2 percent were infected with streptococci, it was concluded that such direct comparison leaves the status of No. 3 udders largely unexplained.

"Consideration of the physical examination status and all accumulated evidence of infection and mastitis of each cow for whole lactation periods suggested that staphylococcal infection was possibly responsible for many of the No. 3 classifications. Udders classed as No. 2 showed little evidence of mastitis, and the organisms infecting them (particularly staphylococci) appeared to be of lower pathogenicity than those of No. 3 udders. Such udders, therefore, are essentially normal. No. 3 udders presented physical examination changes midway between those of No. 2 and No. 4 udders, showed a much higher incidence of clinical mastitis and positive strip-cup and pH tests than did No. 2 udders, and were predominantly infected with staphylococci. Such staphylococci were presumably more pathogenic than those present in No. 2 udders. No. 4 udders presented marked changes on physical examination, were largely infected with streptococci, and showed the highest incidence of clinical mastitis and positive strip-cup and pH tests.

"'Work' or 'aging' influences may play some part in the formation of the higher udder classifications, but in the data collected they could not be separated from the influence of infection, and thus no conclusion could be drawn."

A comparative study of the blood plate, Hotis test, and Breed smear as used for the laboratory diagnosis of bovine mastitis, E. S. BIDDLE (Univ. Del.). (*North Amer. Vet., 25 (1944), No. 8, pp. 476–479*).—From this comparison it is concluded that "the blood-agar-plate test is 26.82 percent more efficient than the Hotis test and 9.74 percent more efficient than the Breed smear in detecting *Streptococcus agalactiae.* The blood-agar plate may fail to detect *S. agalactiae* in quarters shedding few organisms. This may be overcome by subsequent testing. The Hotis test and Breed smear are of limited value in detecting organisms of mastitis significance other than *S. agalactiae.* The Hotis test and Breed smear gave an appreciable number of 'false' positive reactions. The time required for conducting the blood-agar-plate test is approximately the same as for the Hotis test or Breed smear."

Comparison of the incidence of udder infection and mastitis in two cow families, J. M. MURPHY, K. O. PFAU, O. L. LEPARD, and J. W. BARTLETT. (N. J. Expt. Stas.). (*Cornell Vet., 34 (1944), No. 3, pp. 185–192*).—Histories of two cow families living under the same conditions as part of a milking herd for 6 yr. showed that one family, composed of the dam, three daughters, and two granddaughters, was infected with streptococci during 24 percent and with staphylococci during 39.3 percent of its milking time. The other family, composed of the dam, four daughters, and two granddaughters, was found to be infected with streptococci during 0.9 percent and with staphylococci during 10.9 percent of its milking time. The mastitis histories, based on leucocyte counts, strip-cup tests, and physical examination of the udder, also showed a distinct difference in the same direction as the infection histories. There was no significant difference in the milk and butterfat production of the two families. It is concluded that heredity definitely plays a part in bovine udder infection and mastitis.

Single versus multiple injection of sulfanilamide-in-oil in the treatment of streptococcic bovine mastitis, C. C. PALMER and J. C. KAKAVAS. (Univ. Del.). (*North Amer. Vet., 25 (1944), No. 6, pp. 348–349*).—Tabulated results in a herd of milking and dry cows showed that 42.85 percent of the infected quarters became free of infection in the group of 10 cows receiving a large single dose of the sulfanilamide-in-oil previously noted (E. S. R., 88, p. 101), as compared with 96.6 percent of cures in the group of 17 receiving four daily treatments.

So-called enterotoxemia of lambs in California, J. W. BRITTON and H. S. CAMERON. (Univ. Calif.). (*Cornell Vet., 34 (1944), No. 1, pp. 19–30*).—Study of the literature (44 references) and experience in 10 outbreaks in California is held to reveal a need for more definite knowledge of the etiology, but to permit of the following tentative conclusions:

"The theory that this is an infectious disease, caused by absorption of the toxin of *Cl[ostridium] welchii* type-D, is inadequate. Apparently the chief etiological factor in these outbreaks (characterized by sudden onset and high mortality in lambs) can be found in the quantity and quality of the ration. The mechanism in fatal cases appears closely similar to that operating in inhibitory ileus of man."

Effects of experimental nodular worm (Oesophagostomum columbianum) infection in sheep, M. P. SARLES (*U. S. Dept. Agr., Tech. Bul. 875 (1944), pp. 19, illus. 5*).—A study was made of the clinical and pathological effects produced by the administration of 28 daily doses of 10, 100, and 1,000 *O. columbianum* larvae to lambs. Two rams and two ewe lambs were used in each group, as well as in a control group of uninfected lambs. The animals were approximately 8 mo. of age when first infected, were of mixed breeding, and were fed an adequate ration of hay and grain.

Parasitological data indicated that the establishment and persistence of adult nodular worm infection in the intestines of the sheep became decreasingly less as the number of larvae administered increased. The daily ingestion of the larvae produced marked symptoms and pathological changes, the severity of which was determined both by the number of larvae administered and the directly related number of nodules in the walls of the intestines rather than by the number of mature parasites in the lumen of the intestine. Symptoms included loss of weight, decreased rate of gain in weight, slight elevation of rectal temperature, inactivity and unresponsiveness, diarrhea, loss of appetite, weakness, emaciation, stunting, and anemia.

Except for general emaciation and depletion of fat reserves the pathological changes were chiefly intestinal. They included nodular involvement of all parts of the small and large intestines; nodular constrictions, thickenings, and adhesions in those regions where some stasis occurs (terminal ileum, cecum, colon, crown, and rectum); extraintestinal nodules in the liver, omentum, and in the greatly enlarged mesenteric lymph nodes; local lesions in the form of small, deep hemorrhages and small ulcerations in the reddened and thickened mucosa of the dilated and reddened first coil of the crown, where the adult nodular worms were found in greatest numbers.

Nodular worm infection reduced the weight of the live sheep, weights of the pelts and organs, the amount of lean and fat in the carcass and chops, the dressing-out percentage, and increased the degree of shrinkage of the carcass on storage. The wool from severely infected sheep was short and dry and showed breaks in the fibers.

It is concluded that the debilitating effects of the disease are mainly due to interference with normal intestinal functions produced by the nodular involvement of the intestinal wall that follows penetration of the larval stage of the parasite.

Factors influencing embryonation and survival of eggs of the stomach worm, Haemonchus contortus, D. A. Shorb. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 7, pp. 279–287*).—Using feces of sheep experimentally infested with *H. contortus,* the effect of lack of oxygen, drying, and adverse temperatures on egg survival was tested at Beltsville, Md., from August 1936 to February 1940. After culture jars were sealed so that no fresh air could enter, embryonation of *H. contortus* eggs in the cultures ceased, and in less than 4 weeks but more than 3 weeks the viability of the eggs was destroyed. At temperatures below 55° F. no development to infectivity of *H. contortus* took place, and death resulted if the exposure was sufficiently long. Constant temperatures above 98° were deleterious to the eggs. There was little difference in the number of larvae that developed from eggs kept at temperatures of 90° to 96° and 93° to 99° and those kept at 70°. The lethal effect observed increased with the deviation from the optimum temperatures. Drying killed eggs rapidly, but a few survived several hours in apparently dry feces. When the moisture content of the feces was lowered by drying the feces at a relatively low humidity or by means of air currents at a relatively high humidity, the death rate of eggs was raised.

The data are interpreted as indicating that in the western half of the United States, where two-thirds of the sheep and lambs are raised, the climate is usually too dry in the summer and too cold in the winter for the survival of eggs of *H. contortus,* except on irrigated pastures. Nearly all the remaining third of the sheep and lambs raised in this country are found where the winters are cold and embryonation of eggs in normal years would be possible only from May to September, inclusive. The experiments involving the effect of reduced oxygen supply on the survival of *H. contortus* eggs "indicate that as a source of *Haemonchus* infection swamps and ponds with much organic matter may have been overrated. Most *H. contortus* eggs falling in such ponds or on swampy ground would die for lack of sufficient oxygen."

The anthelmintic efficiency against sheep nematodes of copper-nicotine sulfate alone and copper-nicotine sulfate in conjunction with phenothiazine in salt, A. R. Martin. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 3, pp. 241–247*).—Nineteen ewes and 19 of their lambs were given a copper-nicotine sulfate drench monthly while on pasture, with access to pure salt, while 39 ewes and 40 of their lambs were handled in the same way on another pasture and received similar drenches, with free access to phenothiazine with salt (1 : 15). The phenothiazine group suffered no apparent deleterious effects from the administration of the drug in the manner described. Scours and diarrhea, certain nematodes (medium-sized stomach worms, trichostrongyles, and nodular worms), and the incidence of nodules in the intestinal tracts were significantly reduced in the phenothiazine-treated lambs as compared with the group getting pure salt only.

Shikles syringe with the Whitlock nozzle for administering anthelmintics to sheep, D. F. Eveleth and J. O. Foss. (N. Dak. Expt. Sta.). (*Vet. Med., 39 (1944), No. 10, p. 388, illus. 1*).—This apparatus is found useful for most liquid anthelmintics, although certain precautions must be observed.

Diseases of pigs before and after weaning, J. S. Koen. (U. S. D. A.). (*North Amer. Vet., 25 (1944), No. 6, pp. 339–347*).—An address discussing losses due to abortion, anemia, scours, cholera, erysipelas, enteritis, and parasitism.

Report on a type of rhinitis in swine, L. P. DOYLE, C. R. DONHAM, and L. M. HUTCHINGS. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 810, pp. 132–133, illus. 2*).—A dystrophic rhinitis encountered in five herds of swine from widely separated sections of Indiana is described. The most conspicuous symptoms are a distortion of the snout and frequent sneezing. Retarded growth or stunting is an important effect of the disease.

The effect of phenothiazine on horses, L. E. SWANSON. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 810, pp. 134–135*).—Thirty gm. of phenothiazine mixed with oats and given after feed had been withheld for 18 hr. was found to be highly efficient in removing *Strongylus* spp. from 65 mature, well-groomed horses of various ages. Fifty-gm. doses given to each of three animals were not superior in this respect to the smaller dosage. A slight decrease in the volume of packed red blood cells was observed on the seventh day following treatment, but complete recovery of the percentage of packed cells occurred in all animals by the fifty-fourth day. Recovery was more rapid in some animals than others.

Chronic focal encephalitis in a dog resulting in cerebral necrosis: Report of case, W. B. DUBLIN and C. F. SCHLOTTHAUER (*North Amer. Vet., 25 (1944), No. 6, pp. 356–358, illus. 3*).—A case of focal cerebral softening in a dog is presented. The microscopic picture was that of chronic encephalitis. Among signs and symptoms, hemiparesis and hemianopsia were outstanding.

The field use of sulfathiazole in some diseases of poultry, N. E. WERNICOFF and T. M. GOLDHAFT (*Cornell Vet., 34 (1944), No. 3, pp. 199–213*).—This report covers the field use of sulfathiazole in acute coryza on 12 farms, involving the treatment of 70,355 birds, chronic coryza on 2 farms with 7,100 birds, infectious bronchitis on 1 farm with 6,500 birds, fowl cholera on 1 farm with 2,000 birds, and one case of duck cholera in 1,200 birds.

Sulfathiazole was found more readily acceptable to birds in dry mash than in wet mash. Results indicate that in poultry the dose should be ½ lb. of sulfathiazole to 100 lb. of mash, and in ducks ¼ lb. of sulfathiazole to 100 lb. of mash. Acute coryza responded to treatment within 3 to 4 days, and, when chickens suffering from miscellaneous respiratory infections respond to sulfathiazole medication, it is a strong indication that the condition is acute coryza.

"Sulfathiazole provides a means for the protection of breeding males upon their introduction into breeding pens with birds where acute coryza is a carrier problem. Treated and recovered birds remain carriers of acute coryza, and the disease tends to recur.

"The one case of fowl cholera treated failed to show any response to sulfathiazole therapy. On the other hand, one case of duck cholera showed spectacular improvement."

A study of leg anomaly caused by confining chickens in small cages, P. J. SCHAIBLE, B. R. BURMESTER, J. F. SYKES, and F. THORP, JR. (Mich. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Physiol., 141 (1944), No. 2, pp. 274–280, illus. 3*).—In this comparison of chickens raised in batteries with those isolated in small cages, the latter developed leg weakness and, finally, leg deformities. In the terminal stages, the leg bones were deformed and the Achilles tendon slipped over the condyle. Wasting of the leg tissue usually accompanied the disorder. The birds were also inferior in the capacity of their gastrocnemius muscles to do work. Nutrition and other phases of management did not seem to be related to the development of the anomaly, which is thought to be more probably caused by the very close confinement.

Spontaneous arteriosclerosis in chickens, D. V. DAUBER (*Arch. Pathol., 38 (1944), No. 1, pp. 46–51, illus. 2*).—Examinations made at a canning plant of the aortas of 53 roosters and 138 hens indicated that spontaneous arteriosclerosis develops in 45 percent of commercial roosters and hens over 1 yr. old. The incidence of macroscopic lesions is the same in both sexes. Hens alone show fatty lesions of the intima of the ascending aorta and arch, while both roosters and hens commonly have intimal lesions of the abdominal aorta. Arteriosclerosis in the chicken resembles human arteriosclerosis and, when occurring spontaneously, resembles that produced by cholesterol feeding.

A spontaneous fibrosarcoma in a thirteen-day-old chick, R. F. BALL and F. B. HUTT. (Cornell Univ.). (*Cornell Vet., 34 (1944), No. 3, pp. 254–256, illus. 1*).—"The natural occurrence of this malignant tumor in a chick only 13 days of age is further proof of the susceptibility of the very young chick to neoplastic growths."

Glycogen in the life cycle of the coccidium, Eimeria tenella, S. A. EDGAR, C. A. HERRICK, and L. A. FRASER. (Univ. Wis.). (*Amer. Micros. Soc. Trans., 63 (1944), No. 3, pp. 199–202*).—These studies were made to determine when glycogen first appears in the life cycle of this parasite and its ultimate fate. Oocysts which had been freshly passed from the cecal pouch of the chicken were all found to contain glycogen, but none was found in the microgametes or the microgametocytes. This glycogen is deemed undoubtedly the source of the energy which is used in the sporulation process.

The status of vinegar in the control of coccidiosis in chickens, E. A. ALLEN. (U. S. D. A.). (*Vet. Med., 39 (1944), No. 10, pp. 389–391, illus. 3*).—In six experiments with young chickens, the data indicated that a vinegar solution containing 1 part vinegar to 79 parts water, used as a substitute for the regular drinking water, did not control cecal coccidiosis. Water to which acetic acid was added to make a comparable solution proved to be no more effective.

Transmission of Salmonella pullorum by flies, R. GWATKIN and C. A. MITCHELL (*Canad. Jour. Pub. Health, 35 (1944), No. 7, pp. 281–285*).—Chicks hatched from eggs obtained from a flock which had been free from pullorum disease for years were used. In the first two experiments, chicks died from pullorum disease following access to feed contaminated by infected flies and to the flies themselves, some of which were probably eaten by the chicks. In the third and fourth experiments, *S. pullorum* was not recovered from any of the chicks which had been given feed to which infected flies had had access. In the fifth experiment, the disease was produced in a small number of chicks by feeding chick mash which had been contaminated by infected flies. Some of the infected flies themselves were fed to another group of chicks and the organism was also recovered from a small proportion.

"Subsequent failure to infect chicks by feeding or injecting relatively large amounts of culture suggests that the small number infected in the later experiments was probably due to lowered virulence of the infective agent. Virulence of the infective agent would be better assured for this type of experiment by using organisms taken direct from chicks dead of the disease instead of cultures of the organism."

S. pullorum was recovered from the feet and wings of flies immediately after exposure and 6 hr. later. It was recovered from the gastrointestinal tract up to 5 days.

A study of the defense mechanism involved in hereditary resistance to pullorum disease of the domestic fowl, J. M. SEVERENS, E. ROBERTS, and L. E. CARD. (Univ. Ill.). (*Jour. Infect. Diseases, 75 (1944), No. 1, pp. 33–46, illus. 7*).—Results of studies conducted for several years to determine the factors involved in resistance and susceptibility to infection with *Salmonella pullorum* (E. S. R., 74, p. 701) are presented to show that resistance to infection with *S. pullorum* increases rapidly during the first 5 days of life in resistant and for 10 days in susceptible chicks, at which ages the chicks are relatively immune. Occurring simultaneously is an increase in the number of lymphocytes of the blood. This increase is more rapid in the case of resistant chicks, as is also the rise in resistance. The lymphocytes exhibited phagocytic activity when a mixture of citrated blood and bacterial suspension was incubated at 37.5° C. Reduction in the number of lymphocytes by X-ray radiation causes a decrease in resistance to pullorum disease. This is true not only in 1-day-old chicks but also in 6-day-old chicks, which ordinarily are totally refractive.

Studies of the spleen, which is an important source of lymphocytes, showed that spleens of resistant chicks are larger than spleens of susceptible chicks. Removal of spleens of resistant chicks caused a reduction in number of lymphocytes and a reduction in resistance. In the case of subcutaneous inoculation, splenectomized resistant chicks were as susceptible as were normal susceptible chicks. Splenectomy of susceptible chicks caused only a slight decrease in lymphocytes, and a corresponding decrease in resistance. Histological examination of spleens revealed more lymphocytes in the arterial sheaths in spleens of resistant chicks than in spleens of susceptible chicks. These facts suggested strongly that the spleen is an important organ in natural resistance to pullorum disease.

Specially designed experiments showed that the alimentary canal does not act as a defense mechanism. Comparison of results following oral and subcutaneous inoculation indicated that the lymphocyte level possessed by the chicks, at the time the infecting organism reaches the blood stream, determines the degree of resistance.

The effect of nicotine-bentonite and of certain physical states upon the efficacy of phenothiazine against nematodes in fowls, P. D. HARWOOD and J. E. GUTHRIE (*Jour. Parasitol., 30 (1944), No. 3, pp. 143–152*).—Mixtures of phenothiazine and nicotine-bentonite were given in tablet form or in capsules to more than 100 naturally infected cockerels of 3 breeds. A tablet weighing 1.33 ± 0.029 gm. and containing phenothiazine 1 part and nicotine-bentonite 2 parts proved effective for the removal of both *Ascaridia and Heterakis.* A dose of 40 tablets did not prove fatal to 1 cockerel weighing 1,190 gm., although the dose contained 1.75 gm. of nicotine. The use of coarse ground phenothiazine or of micronized phenothiazine did not affect appreciably the value of the compound for the removal of *Heterakis.* A "wettable" grade of phenothiazine proved as effective as ordinary commercial phenothiazine.

The effect of prickly-ash bark upon the efficacy of phenothiazine against nematodes in fowls, P. D. HARWOOD and J. E. GUTHRIE (*Jour. Parasitol., 30 (1944), No. 3, p. 197*).—In view of the findings of Haller et al. (E. S. R., 87, p. 830), indicating that certain compounds found in the bark of southern prickly ash (*Zanthoxylum clavaherculis*) activate the insecticidal properties of pyrethrum, 1 gm. of this bark plus 0.2 gm. phenothiazine was fed to six Ancona cockerels in the hope of discovering an effective synergist. As compared with six similar cockerels fed only the phenothiazine, the records indicated no appreciable influence of the bark on the efficacy of phenothiazine administered simultaneously.

Three hitherto unreported turkey diseases in Connecticut—erysipelas, hexamitiasis, mycotic encephalomalacia, E. JUNGHERR and R. GIFFORD. ([Conn.] Storrs Expt. Sta.). (*Cornell Vet., 34 (1944), No. 3, pp. 214–226, illus. 3*).—Erysipelas has been observed in three cases of marketable turkeys since 1940, and in a single case bacteriologically verified in piglets and in white mice. Turkey erysipelas was found to occur usually in the fall, with sudden high mortality, and did not appear to carry over into the next season. Serologically positive reactors may persist for several months following an outbreak. The spleen and testicle often presented sharply defined hemorrhagic infarcts which, if present, may be considered parthognomonic. The predominating hemorrhagic lesions developed primarily on a thrombotic-embolic basis.

Hexamitiasis, reported in the literature as occurring in California, has been found in two lots of summer-raised poults in Connecticut. One case was complicated by moniliasis, the other by mild intestinal coccidiosis. The mortality was high and of relatively long duration, but tended to subside with advancing age. Clinical, gross, and histopathologic observations were not contributory to the diagnosis, which had to rest solely upon systematic direct microscopic smears from fresh intestinal specimens. The histologic changes observed were not explanatory of the pathogenesis of the condition.

"Crazy chick" symptoms characterized by incoordination, retraction of head, retropulsion, and other neurologic evidence of cerebellar disturbance were observed in two lots of poults. In contrast to findings in chicks in which this syndrome is known to develop on the basis of E avitaminosis, one turkey case was found to be due to mycotic meningitis associated with cerebellar encephalomalacia, and the other pneumomycosis associated with toxic encephalomalacia.

Gopher snakes as carriers of salmonellosis and paracolon infections, W. R. HINSHAW and E. MCNEIL. (Univ. Calif.). (*Cornell Vet., 34 (1944), No. 3, pp. 248–254*).—The isolation of *Salmonella meleagridis* is reported from a gopher snake killed on a ranch where turkeys were dying from salmonellosis caused by this type. From the same snake, a paracolon having similar H antigens to the Edwards, Cherry, and Brunner type 8, but with unidentified O antigens was isolated. At later dates, from three other snakes caught on the ranch, a type 8 paracolon was isolated. Type 8 paracolon was also isolated from sick poults from this ranch. From three of six chicks removed from the first snake, *S. panama* was isolated. Thus from the single snake two Salmonellas and one paracolon type were isolated. "These studies indicate that snakes may be important transmitters of such organisms."

Snakes, cats, and flies as carriers of Salmonella typhimurium, E. MCNEIL and W. R. HINSHAW. (Univ. Calif.) (*Poultry Sci., 23 (1944), No. 5, pp. 456–457*). —Supplementing the observations noted above, the isolation of *S. typhimurium* on two infected turkey ranches is recorded from a gopher snake, a garter snake, two cats, and from houseflies.

A natural case of canary malaria, F. R. BEAUDETTE. (N. J. Expt. Stas.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 809, pp. 91–92*).—The blood was found to be infected with a *Plasmodium*, probably *P. cathemerium*.

AGRICULTURAL ENGINEERING

China must have agricultural engineering, P. W. TSOU (*Agr. Engin., 25 (1944), No. 8, p. 297*).—In the post-war industrialization of China, for which planning is already under way, the author foresees a sharp change in the agricultural situation of that country. At present he finds about 80 percent of the Chinese population, or about 360 million persons, farming approximately 4 acres each, with abundant help, whereas a large demand of the projected new industries for labor will produce a situation in which the individual farmer will operate a much larger farm with less help. In addition to the large factories in the cities, he sees need for numerous smaller manufacturing and processing plants in rural districts for slack season employment to save volume, tonnage, and cost of transportation. In the processing of the more bulky farm products, the machinery for such industries as sugar refining, cotton ginning, fruit and vegetable canning and dehydration, and the like will have to be designed by the agricultural engineers to suit the rural conditions in China. The services of agricultural engineers will be needed both for this work and for the modernization and mechanization of the country's agriculture. In China today there is "a good bureau of agricultural research, a few well-organized provincial agricultural experiment stations, 17 agricultural colleges (private and public), a board on agricultural extension, a strong farmers' bank with branches in practically all provinces. What is needed now is to strengthen the above organizations and to adopt a sound system for the coordination of their work."

To provide the necessary corps of experts for the development of an adequate supply of native agricultural engineers the author proposes an organized program of agricultural engineering development in China, including the establishment of a department of agricultural engineering in the Central University and strengthening of that in the Nanking University and the establishment of such a department in the National Bureau of Agricultural Research, training of 90 Chinese experts in agricultural engineering in the United States by at least 2 yr. in schools and 1 yr. of factory and farm experience; establishment of farm implement manufacture in China; a rural credit system capable of financing farmers and their cooperatives in the purchase of necessary machines and implements; an extension service giving due emphasis to the engineering phases of the agricultural program; etc.

Brush removal for pasture improvement, M. B. Cox and H. M. ELWELL (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 7, pp. 253, 261*).—The authors discuss means of brush clearing for land-use improvement in an extensive land type characterized by native grass too sparse for pasture, together with scrubby oak. Removal of worthless tree growth resulted in the comparatively rapid restoration of good grazing conditions.

Both horse-drawn and tractor mowers, equipped with standard sections and guards, operated satisfactorily on young tender sprouts and weeds. When heavy material was encountered, the long points and standard sections bent or broke if they struck big sprouts, stumps, or stones. Equipment with heavy sections and rock or round nose guards was used satisfactorily on oak, sumac, and persimmon sprouts. In cutting the larger stems it was found advantageous to operate the tractor in low gear to give more cutting strokes per foot of travel. Trees too large for the mower were best removed by hand ahead of the mower. A mobile saw, consisting of a 60-in. saw mounted on the front of a tractor, would cut trees from 5 to 6 in. in diameter at the ground level with the tractor in motion. The tree was approached so that the saw would just cut through the trunk as it passed. The saw worked well on small trees with the tractor in motion. With the tractor not in motion, difficulties were encountered, especially where it was necessary to trim and remove fallen trees before further work could be done with the saw. Another difficulty was the maintenance of the saw teeth under sustained work on large trees. When trees were cut at or near the ground surface, soil pulled into the saw cut had a grinding effect which soon removed the set of the teeth. This damage could not be corrected by merely resetting.

Brush removal was effected by the construction of an all-metal, power-lift buck rake designed to operate on the front of a farm tractor equipped with hydraulic-lift cylinders.

Geology and ground-water resources of the Big Spring area, Texas, P. LIVINGSTON and R. R. BENNETT (*U. S. Geol. Survey, Water-Supply Paper 913 (1944), pp. 113+, illus. 21*).—Two large sinks or depressions which, with a relatively small supply pumped from well fields between them, constitute the water supply of the city of Big Spring, are described in terms of their geological nature and probable origin. It is estimated that the perennial yield of the sinks and intervening well fields amounts to an average of about 450,000 gal. a day. For several years the pumpage has been much more than that, and in 1937 it amounted to an average of about 1,000,000 gal. a day. A large part of the water has therefore come from storage, and as a result the water table in the sinks, where the draft has been greatest, has declined to lower levels each year. If the water supply needed by the city continues to increase at the normal rate, most of the remaining water will be exhausted from the sinks in a few years if no other supply is provided.

Geology of dam sites on the upper tributaries of the Columbia River in Idaho and Montana.—Part 2, Hungry Horse dam and reservoir site, South Fork, Flathead River, Flathead County, Montana, C. E. ERDMANN (*U. S. Geol. Survey, Water-Supply Paper 866–B (1944), pp. 116+, illus. 11*).—The Hungry Horse dam site, in Flathead County, Montana, is suitable for a high concrete dam, and leakage from the reservoir area appears to be improbable. Geologic conditions at the dam site are relatively simple. A low saddle in the drainage divide of the reservoir site limits the maximum height of a dam to 630 ft. above the foundation, but other considerations limit the practical height to 500 ft. (high-water flow line 3,540 ft.). The pool would probably contain ice for about 4 mo. of each year, but the shape of the reservoir just above the dam would be such that the structure would be protected from wave action and ice thrust.

The proposed dam will serve the purposes of power, stream regulation, flood control, and, possibly, irrigation.

Nevada cooperative snow surveys, Parts 1, 2. (Nev. Expt. Sta., U. S. D. A., et al.). (*Nev. Coop. Snow Surveys, 1944, pts. 1, pp.* [*4*]; *2, pp. 32*).—In part 1, Central Sierra Quadrangle, by H. P. Boardman et al., the probable stream flows are predicted as of the date April 1944 at from 45.2 to 59.9 percent of the normal in the streams listed. A comparison of the predicted with the actual acre-feet and the percentages of normal shows predictions agreeing with the actual flows within 5 percent, except with regard to the flow in the East Walker River. This stream showed an actual flow of 82,330 acre-ft. as against 60,000 predicted.

In part 2, Humboldt River Basin, Eastern and Southern Nevada, National Wild-Life Refuges, by J. E. Church and H. P. Boardman, except in the Marys River, capable of being influenced from very little to as much as 25 percent by a relatively high water table, the predicted stream flows ranged from 83 to 99 percent of normal. The Marys River figure, allowance being made for the wide possible variation in the effect of the water table, is given as from 65 to 90 percent.

Some field applications of water transmissibility and storage coefficients, R. G. KAZMANN (*Agr. Engin., 25 (1944), No. 8, pp. 299–300, 304, illus. 1*).—The author shows the manner in which these coefficients can be applied to field conditions and the practical results which may be reasonably expected. He defines the coefficient of storage as the quantity of water, in cubic feet, yielded from each vertical column of the aquifer with a base of 1 sq. ft. as a result of a drop of 1 ft. in water level, and the coefficient of transmissibility as the coefficient of permeability multiplied by the thickness of the formation in feet. As an illustration of the practical use of these data he discusses three examples of the application of such coefficients, (1) to determine the source of water supply, (2) the quantity to be expected from each source, and (3) the minimum yield to be expected from a well field under assumed conditions of operation. Additional applications of these coefficients include the optimum spacing of wells and the prediction of water levels over a long period of time to prevent obsolescence of equipment.

Clay lining of canals proving to be relatively permanent, O. W. ISRAELSEN (*Farm and Home Sci.* [*Utah Sta.*], *5 (1944), No. 3, pp. 14–15, illus. 4*).—The author points out that Utah has 9,000 miles of irrigation canals and ditches, of which less than 3 percent are lined. The 8,740 miles of unlined earth canals and ditches sustain seepage losses which in some cases are excessive and wasteful. Seepage losses not only waste water and decrease the productivity of soils by causing waterlogging and alkali accumulation, they also cause settlement of canal banks, breaks in canals, and earth slides with great damage to canals and losses to irrigators.

As remedies for seepage losses, compaction of the beds and banks of the larger canals by means of heavy sheeps'-foot rollers or other heavy rolling equipment can frequently be performed at a cost much less than that of clay lining; or clay lining may be applied with such reduction of the loss as that from 120 ft. per year to 0.12 ft. per year. In the experiments in which this very large loss reduction was effected the average loss through the clay lining was still only 0.12 ft. per year (average of four tests with a perimeter 12 in. in diameter and 30 in. long) in measurements made 3.5 yr. after the lining had been put in. It was observed, however, that excessive growth of moss in the canal has decreased the velocity of water flow and increased the depth. In some places seepage through the sandy banks of the canal above the clay lining had occurred, a loss caused by excessive water depth resulting from moss growth. Recent inspection showed that the clay lining that had been covered with gravel was in good condition, with minor exceptions. Special effort to control moss, and thereby avoid excessive water depths, is essential to full realization of the value of the clay lining, however.

A new irrigation sprinkler, M. A. SHARP. (Univ. Tenn.). (*Agr. Engin., 25 (1944), No. 7, p. 252, illus. 1*).—The author describes a device, developed in cooperation with the Tennessee Valley Authority, which has a capacity of 400 gal. per minute and is so designed as to rotate slowly and distribute water uniformly over an area 150 ft. square at 60 lb. pressure. By using two sprinklers, each having a capacity of 200 g. p. m., it is not necessary to shut off the pump while changing locations. A valve in the delivery pipe is used to shut off the water from one sprinkler while it is being moved, the other absorbing the slightly higher pressure thus produced. It takes one man about 6 min. to move a sprinkler to a new location, and for a 1-in. application they are moved every hour. Since most soils will readily absorb 1 in. of water in 30 min. when dry enough to need irrigation, one man could operate two sprinklers on a pumping unit delivering 800 g. p. m. and cover nearly 2 acres per hour. These sprinklers are attached to light-weight irrigation pipe couplings and can be connected to risers in a few seconds.

Soil and water conservation in irrigated areas, F. KIMBALL. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 8, pp. 285–289, illus. 3*).—The author here presents a general view of the problems, methods, and some of the results of the work of the Soil Conservation Service in the areas of irrigation farming. The progress of organization into conservation districts has been rapid in the past 3 yr., a period within which new districts were organized to include some 3,000,000 acres of irrigated lands. At present, approximately 255 soil conservation districts in irrigated areas include nearly 4,000,000 acres of irrigated lands, one-fifth of the total irrigated acreage in the United States.

Among other phases of the subject which are here taken up are the opportunities for increased food supply offered by the many small diversions serving isolated sections of mountain valleys and meadowlands, technical assistance in the construction of diversion dams, preparation of conservation plans for individual farms, and the importance of knowledge of soil profile characteristics.

A system for checking terraces, J. C. WOOLEY. (Univ. Mo.). (*Agr. Engin., 25 (1944), No. 7, pp. 260–261, illus. 2*).—The system described consists of a graph sheet ruled vertically in divisions representing 50-ft. distances along the terrace and horizontally representing rod readings in feet and tenths, together with dotted lines showing the correct grade at all points and correct heights of the terrace ridge for slight, medium, and steep slope. Rod readings are to be plotted upon the chart, and the resulting irregular line upon inverting the chart will constitute a profile of the terrace and will indicate all corrections needed. The author points out that the statement is often made that "ponds will do no harm; they will soon silt in and bring the terrace to grade." Years of experience have proved that there is usually so little soil movement between terraces that the ponds will be there for a decade unless something is done to correct the grade; and that if there is appreciable soil movement between terraces, the deltas built in the channel are more often the cause of ponding than a remedy for it.

A method of approach to farm power studies, H. H. STIPPLER. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 7, pp. 255–259, illus. 1*).—The author points out that comparison of the production requirements as between one area and another or one crop and another is incomplete if labor requirements only are compared, since differences in mechanized or animal power used may alter the labor requirement within wide limits. Differences among types and sizes of both animal and mechanical power units make a determination of power used somewhat difficult, but the following method is suggested: (1) Calculate the total energy requirements for a specific time period from the drawbar pull of an implement (ascertained from tests if possible) and the average speed at which the particular operation is usually performed, (2) obtain the average time required on an acreage basis, (3) determine the theoretical acreage covered using width of implement, speed of operation, and time of application, (4) reduce the calculated acreage by the application of a factor which takes into consideration delays and overlapping of implements drawn which are unavoidable under field conditions, and (5) determine drawbar horsepower-hours required per acre by dividing total energy requirements as determined from (1) for the various operations by the acreage covered as determined in (4). These will serve as standards for a particular area with which power used on farms may be compared. The author emphasizes, among other advantages of the procedure outlined, that "the method of analysis suggested will bring about a clear distinction between 'power' requirements and 'power' consumption. Conditions that are or are not under the control of farm operators result in a greater energy consumption on farms than is required. For this reason a clear distinction must be made between energy required and energy used."

The A. S. A. E. tractor power take-off and drawbar hitch standardization program, W. J. COULTAS (*Agr. Engin., 25 (1944), No. 8, pp. 284, 289*).—The author here reports some of the work of an advisory committee on engineering of the Farm Equipment Institute, beginning with the submission, by various members, of sample safety shields for implement power lines in 1939, and including standardized dimensions adopted in 1941, of which the most important are stated to be the following: (1) 1⅜ in. or 1¾ in. spline connection; (2) lateral dimension from hitch point to the rear end of the power take-off shaft, 14 in.; (3) vertical dimension from ground line to tractor drawbar, from 12 to 15 in.; and (4) vertical dimension between drawbar and power take-off shaft, from 6 to 15 in. For the use of new implements with old tractors or for old implements to be used with new tractors, conversion units listed by the American Society of Agricultural Engineers are recommended.

[Beet machinery] (*Idaho Sta. Bul. 255 (1944), p. 25*).—Field studies of mechanical beet harvesting equipment during the 1943 season showed that under favorable conditions the single-row topper, lifter, and windrowing machine could handle a maximum of 5.5 tons per hour. Because of inexperienced operators and the fact that the machines were in the development stage, however, the average actual operation was about 2.5 tons per hour. The rotary disk variable-cut-type of topper appeared to have some advantage over the fixed blade. The mechanical beet loader, handling 8-row windrows at the rate of a ton per minute, made it possible for a single loader to handle beets from more than one topper. Some farm-made windrow beet loading equipment included the adaptation of the standard potato digger with elevator.

The U. S. D. A. caster bean hullers, I .F. Reed and O. A. Brown. (U. S. D. A.). (*Agr. Engin., 25 (1944), No. 8, p. 290, illus. 2*).—This new huller is self-contained and mounted on a trailer so that it can be transported easily and ready for service. A sectional view shows the arrangement of the working parts. The machine consists essentially of a self-contained power plant, a hopper and elevator unit, a vibrating feeder, a hulling unit consisting of cylinder and concave, and a separating unit made up of aspirator, fan, and vibrating screens. The arrangement is such that the parts performing one function can be revised or adjusted independently of the remainder of the machine.

The unhulled beans are dumped into a large hopper from which an agitator causes a uniform flow into a cup elevator. The elevator dumps the beans onto a vibrating feeder which causes them to be distributed and fed uniformly to the cylinder. A high percentage of the beans is hulled as they pass between the rotating cylinder and stationary concave. The mixture of hulls, beans, and unhulled beans is discharged into the aspirator unit where the hulls and other light materials are lifted out by an upward air blast and discharged through the fan to the rear of the huller. The beans and heavy materials fall onto the screens in a separating shoe. The top screen retains the unhulled beans and discharges them into the elevator to make the circuit over again. The good beans are retained on the second screen and discharged into the bagger. Cracked beans and small particles of heavy trash pass through this lower screen.

The improved U. S. D. A. huller can be handled and supervised in operation by one man. Its capacity has been increased to between 35 and 40 bu. per hour, but it can be operated with a 2½-hp. air-cooled engine. Under normal conditions it cracks less than 2 percent and the shelling percentage will be above 98 percent. The number of light beans left in the hulled sample depends upon the adjustment of the aspirator.

Controlling weeds by flame, H. T. Barr. (La. Expt. Sta.). (*Agr. Engin., 25 (1944), No. 8, pp. 291–292, illus. 3*).—Heavy infestations with Johnson grass and alligator weed were successfully dealt with in sugarcane plantings by flaming 12 times at weekly intervals from May 12, allegator weed rhizomes having been reduced from 10,904 to 157 lb. per acre. Flaming six times at biweekly intervals from the same date reduced the rhizomes to 395 lb. per acre. Fallow burning with present equipment requires from 1 to 1¼ hr. per acre, consuming 28 gal. of furnace oil per hour. A burner with a large hooded shield to confine the heat for fallow burning is now under construction. With the use of burners consuming about 1½ gal. of furnace oil or Diesel oil per hour burners set 19 in. apart, the flame directed to the base of the cane plant, and a speed of 2 miles per hour, except where very heavy weed infestation required reduction in speed to 1½ miles per hour, the cane was not injured and yields were as good as those of hand-hoed plats or better, with much saving of labor time. Similar results were obtained in the flaming of weed growth in cotton.

The author finds that the flame cultivator is proving indispensable during the present acute labor shortage, and that most operators believe that under normal conditions, with adequate labor available, it will prove more efficient and economical than hand hoeing.

The relation of farm structures to agriculture, D. G. Carter. (Univ. Ill.). (*Agr. Engin., 25 (1944), No. 8, pp. 281–283, 289, illus. 3*).—This is a general discussion of the current and probable post-war farm building situation. The author holds a building rate of 2 billion dollars per year through the 10-yr. period after the war to be not unlikely, since a 20 billion dollar estimate for the replacement cost for structures in present need of replacement is believed conservative. Unsuitable or inadequate buildings frequently result from use of designs prepared for specific situations and materials but used indiscriminately with other materials and in situations for which the plan was not intended; obsolete plans are still available or are made so by the copying of obsolete structures; while to meet this need for skilled guidance of the farm construction program only about one agricultural engineer per State is employed on farm building research by the experiment stations in the North-Central region, and in the United States as a whole there is less than one public service worker per State trained in farm structures. The number of farm structures specialists in the industrial field is considered to be small in comparison to the need and to the potential farm market. The farm building needs especially emphasized are (1) a better understanding of the relationship of buildings to agricultural production and (2) more engineering and architectural design, basic research, and educational aid to achieve the objectives of economy, fitness, appearance, and efficiency, and to provide a reasonably adequate service to the farmer.

[Radiant energy drying] (*Idaho Sta. Bul. 255 (1944), pp. 23–24*).—A 500-lb. raw product capacity dehydrator was designed and built for the use of a 10-kw.-hr. unit consisting of two banks of R–40 drying lamps. Air circulation was obtained by using a ¼-hp. motor and fan. A number of small experimental home dehydrators were built. Heating units used included standard brooder kits, heat lamps, standard Mazda lamps, and iron-wire elements.

[Potato dehydration investigations] (*Idaho Sta. Bul. 255 (1944), p. 23*).—Among other numerical data here assembled are the facts that, on the basis of an 8-month operating season, from 8,000 to 10,000 carloads of potatoes per year will be required by the dehydration industry of Idaho; and that two typical plants operating on a raw product input of 70,000 and 85,000 lb. of potatoes daily showed a kilowatt-hour requirement of 2.08 per 100 lb. and 1.06 per 100 lb., respectively for the over-all plant use.

[New storages for increased potato crops] (*Idaho Sta. Bul. 255 (1944), p. 24*).—The majority of the new storages were of the underground or cellar type with a total capacity of 9,600 cars. Storages built in connection with some of the dehydration plants were of the above-ground type, however (capacity, 1,400 cars). The improvement in trackside and farm storage facilities aided greatly the handling of the 1943 crop, which was the largest in the history of the State. In a field trial of the methods of waterproofing earth-covered storages with the use of bentonite and layers of mildew-proof paper, the techniques for these waterproofing materials included the use of drainage layers between the earth covering and the waterproofed section.

The loss of moisture and shriveling in apples in storage, D. Comin, W. Junnila, and C. W. Ellenwood (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 246–251*).—A blower-cooled storage showed less shriveling of apples, as indicated by moisture loss by weighing and by observation of the fruits through the storage period, provided that a relative humidity of from 85 to 90 percent was maintained, than did a storage with gravity air movement only. The air velocity throughout most of the storage equipped with forced-air or blower fans was of the order of 10 to 20 ft. per minute at from 7 to 12 ft. from the grille face and was usually much less (from 0 to 10 f. p. m.) in most other parts of the storage. The transpiration of apples was increased only slightly by air moving at velocities of from 400 to 900 f. p. m. when the relative humidity was maintained at a high level.

The fruit kept somewhat better in the center of the stacks than on the floor or on the top layer of the stacks, a result attributed to the higher relative humidity prevailing within the stacks of fruit. The authors did not find any value in coating the inside of apple crates to prevent moisture loss from the fruits to the crates nor any value in covering the concrete floor to prevent absorption of moisture by the floor from the crates and from the fruit. There was an advantage in wetting the crates before placing them in storage to reduce their absorption of moisture from the air. As much as 600 gal. of water may be absorbed from the air of the storage by 10,000 1-bu. slatted crates during the early part of the storage period.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 26 (1944), No. 3, pp. 435–600+, illus. 4*).—Included are the following papers: Changes in Income Distribution in Agriculture With Special Reference to Technological Progress, by E. O. Heady (pp. 435–447) (Iowa Expt. Sta.); A Philosophy of Agricultural Adjustment, With Particular Reference to the Southeast, by R. W. Harrison (pp. 448–460), and The Problem of Post-War Land Settlement and Agricultural Production, by A. T. M. Lee (pp. 461–475) (both U. S. D. A.); Changing Emphases in Agricultural Price Control Programs, by G. Shepherd (pp. 476–502) (Iowa Expt. Sta.); Farm Management Research Needs in New England, by H. Woodworth (pp. 503–513) (Univ. N. H.); Fuller Annual Employment of Farm Labor, by R. J. Smith (pp. 514–528) (Univ. Calif.); The Family Farm, by O. R. Johnson (pp. 529–548), and A Post War Program for American Agriculture, by C. H. Hammar (pp. 549–562) (both Univ. Mo.). The notes include: A Study of Farm Labor in Two Years of War, by W. H. Pine (pp. 563–565) (Kans. Expt. Sta. et al.); Production Functions Derived From Farm Records, by G. Tintner and O. H. Brownlee (pp. 566–571) (Iowa Sta.); and The Relation of Wages to Net Farm Income, 1929–42 and 1939–42, by J. D. Black (pp. 572–578).

[Investigations in agricultural economics by the Idaho station] (*Idaho Sta. Bul. 255 (1944), pp. 32–36*).—A study (pp. 32–33) of business records of 72 farms in the Palouse area in 1942 compares the investments, sources of receipts, expenses, labor income, land ownership, etc., on the farms engaged in the following major enterprises: Peas and small grain; small grain; peas, small grain, and livestock; small grain and livestock; and small grain, some peas, and at least 20 percent or more of acreage in canyon pasture land. Another study (pp. 35–36) of the labor requirements of southwestern Idaho shows the requirements by months for the major crops.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 230 (1944), pp. 233–234, 252*).—The usual table of index numbers of production, prices, and income, by J. I. Falconer, is brought down through June 1944. An article, The Farmer-Owned Elevators of Ohio, by B. A. Wallace and Falconer (pp. 233–234), summarizes some of the findings in Bulletin 650 (E. S. R., 92, p. 131).

Current Farm Economics, [August 1944] (*Cur. Farm Econ. [Oklahoma Sta.], 17 (1944), No. 4, pp. 99–123+, illus. 3*).—In addition to the usual review of the agricultural situation and the tables of prices and price indexes, articles by G. P. Collins are included on Prices Received by Oklahoma Farmers and Those of Other States (pp. 106–114), in which it was found the prices received by Oklahoma farmers rank high compared with other States over a period of years, and on Milk Price and Feed Price Relationships in Oklahoma (pp. 115–123) with tables showing for 12 counties by months, November 1943–April 1944, the prices received, milk-feed price ratios, milk price on a butterfat basis and butterfat-feed ratio for producers; the wholesale and retail milk prices and milk-feed price ratio for the producer-distributor; and the cost of the dairy grain ration.

[Papers bearing on agricultural economics] (*Canad. Jour. Econ. and Polit. Sci., 10 (1944), No. 3, pp. 298–342*).—The following papers having more or less direct application to agricultural economics were presented at the annual meeting of the Canadian Political Science Association, June 1–2, 1944, at McGill University, Montreal: Two Conditions Necessary for Economic Progress in Agriculture, by T. W. Schultz (pp. 298–311); Some Aspects of Canada's Post-War Export Problem, by F. A. Knox (pp. 312–327); and Some Aspects of the Problem of Full Employment, by J. R. Beattie (pp. 328–342).

Shall I be a farmer? P. V. MARIS (*U. S. Dept. Agr., 1944, AWI–105, pp. 34+*).—This booklet was prepared under the auspices of the Interbureau Committee on Post-war Programs for members of the armed forces. The several sections deal with the dream and the real farm, whether to farm or not, kinds of farms, where to farm, how to get started in farming, the costs in starting, where to obtain funds, estimates of income and expenses, veterans with pensionable disabilities, and how to get more information about farming.

Agricultural income, E. H. SEXAUER ET AL. (*Washington 6, D. C., Chamber Com. U. S., 1944, pp. 40, illus. 12*).—A report with recommendations of the Agricultural Department Committee of the Chamber of Commerce of the United States. It discusses the total and per farm income; the geographic variations, sources, factors affecting it; and the expenses of production and net income total and per person on farms.

Food subsidies and inflation control, D. G. JOHNSON and O. H. BROWNLEE (*Wartime Farm and Food Policy Pam. 10 (1944), pp. 53+*).—This tenth bulletin in a series of pamphlets of the Iowa State College Press (E. S. R., 89, p. 740) discusses inflation control as an objective of wartime economic organization, the economic framework within which wartime objectives are to be attained, alternatives in inflation control, subsidies and general price stabilization, and ethical and political arguments on the subsidy issue.

Agricultural trends in the Connecticut Valley region of Massachusetts, 1800–1900, M. R. PABST (*Smith Col. Studies in Hist., 26 (1940–41), No. 1–4, pp. 138+, illus. 10*).—This thesis for the degree of doctor of philosophy at Columbia University is based on a six-town sample. The several chapters deal with the problem; the valley in the early part of the period; the hill, the lowland, and the industrial towns; and the towns and the valley. Appendixes describe the general farm in the valley and include data on crops in Franklin, Hampden, and Hampshire Counties.

Agricultural production and types of farming in Minnesota, S. A. ENGENE and G. A. POND. (Coop. U. S. D. A.). (*Minnesota Sta. Bul. 347, Sup. rev. (1944), pp. 28, illus. 1*).—A revised edition (E. S. R., 83, p. 690).

Farm size in relation to land use, yields, volume, and value of production, and total nutrients, Overton County, Tennessee, H. J. BONSER (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 173 (1944), pp. 53+, illus. 35*).—"Findings in this report are based on land use data from 2,067 farm application forms for participation in county AAA programs; on crop yields reported for 131 sample farms, in 1936, adjusted to county averages reported in U. S. census; and on price estimates for that district by the Federal and State crop and livestock reporting service."

Variations in production per farm and per worker in Missouri, 1939, H. M. HAAG (*Missouri Agr. Col. Ext. Manual 34 (1944), pp. 24, illus. 7*).—The production per farm per worker, per worker employed, and per $1,000 of capital; the distribution of farms according to value of production; the number of workers on farms; and the changes in population from 1940 to 1943 are discussed.

Making the most use of farm labor, S. C. MAYO (*Res. and Farming* [*North Carolina Sta.*], *2* (*1944*), *Prog. Rpt. 1, pp. 8, 10*).—This material was erroneously abstracted as from the Colorado Station (E. S. R., 91, p. 757).

An economic study of land settlement in the Albertville-Garrick area of northern Saskatchewan, 1941, E. C. HOPE and R. A. STUTT (*Ottawa: Canada Dept. Agr., Market. Serv., 1944, pp. 32+*).—A multilith report by the Canada Department of Agriculture and the University of Saskatchewan. The area, the people, net worth of farmers, types of farming, factors affecting settlers' income, farm family cash expenditures, nonfarm sources of income, fertility of soil types, costs and progress in clearing and breaking land, and factors affecting settlers' progress are described and discussed.

Suggested adjustments in Kansas agriculture for 1945, J. A. HODGES ET AL. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 24* (*1944*), *pp. 47+, illus. 1*).—The agricultural situation in Kansas, the level of production recommended for 1945, and the pattern—crop acreages and yields, livestock number and production, and the livestock-feed balance—the obstacles to production, and the difficulties of achieving the recommended pattern of production are discussed.

Production adjustments in Kansas agriculture during the demobilization period (1945), J. A. HODGES ET AL. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 21* (*1944*), *pp. 12+*).—The agricultural situation in Kansas, the level and pattern of production, and the factors and policies needed to obtain the recommended levels are discussed.

Facts on farm tenancy in Kansas, H. HOWE. (Coop. U. S. D. A.). (*Kansas Sta., Agr. Econ. Rpt. 20* (*1943*), *pp. 34+, illus. 7*).—The number of farms operated under different types of tenure, land operated under lease, value of farm real estate not belonging to operators, changes in tenure status, and the individual and the corporation landlord are discussed and forms of different types of leases included. The report supplements Bulletin 303, Farm Tenure Law in Kansas (E. S. R., 88, p. 399); Circular 213, The Stock-Share Lease (E. S. R., 88, p. 399); and Agricultural Economics Report 17, Corporations as Landlords of Kansas Farms (E. S. R., 89, p. 123).

Putting dairying on a war footing, O. H. BROWNLEE. (Iowa Expt. Sta.). (*Wartime Farm and Food Policy Pam. 5, rev.* (*1944*), *pp. 64+*).—This bulletin of the series noted (E. S. R., 89, p. 740) "is a review of prospective supplies and demands for dairy products in 1944 together with an appraisal of some of the national policies which could be followed in meeting the problems growing out of the dairy situation." It discusses the nature of the problem, the kinds of adjustments that might be encouraged and means for doing so, the improvement of milk utilization and measures needed for such improvement, and the wartime adjustments in consumption of dairy products. Utilization including alternatives for milk, cream, and butter, and rationing; and some post-war implications of wartime developments in the dairy industry are also discussed. The appendix includes tables dealing with the relative efficiencies of dairy cattle, beef cattle, hogs, lambs, and chickens in converting feed into edible protein, food energy, and carbohydrate equivalent.

Bibliography on the poultry industry in countries other than Canada and the United States, H. E. HENNEFRUND (*U. S. Dept. Agr., Libr. List 12* (*1944*), *pp. 113*).—"This bibliography relates mainly to the economic and administrative aspects of the poultry industry in countries other than Canada and the United States, 1900 to date. References on the overseas territories and possessions of the United States are included. Legislation, egg-laying contests, advice to producers, and studies of poultry diseases not specifically related to conditions in the country have been omitted. Numerous references to publications containing statistical material have been included, but no attempt has been made to examine the official statistical reports and yearbooks of the various foreign governments. Items are arranged alphabetically by country; those dealing with more than one country are listed in the general and continental sections. The index brings together all the material on each country."

Livestock numbers in Utah, D. A. BROADBENT (*Farm and Home Sci.* [*Utah Sta.*], *5* (*1944*), *No. 3, pp. 1–2, 18–20, illus. 2*).—Charts and tables are included and discussed showing the numbers of livestock on farms, 1867–1944.

Livestock in continental Europe during World War II, H. C. FARNSWORTH (*Food Res. Inst.* [*Stanford Univ.*], *War-Peace Pam. 6* (*1944*), *pp. 63+, illus. 6*).—The pre-war production and trade in major food animals, the shortage of feed and possibilities of adjustment, and the wartime changes in animal numbers and productivity are analyzed. The conditions in the several countries are discussed.

The numbers of cattle, sheep, and horses in continental Europe, exclusive of the Union of Soviet Socialist Republics, declined moderately and those of pigs and poultry sharply during the period 1939–43, the losses being approximately 7 percent, 7 (not given for horses), 30, and 20 percent, respectively, from the pre-war years to 1942–43. Production of concentrates and livestock products declined more than the number of animals. Declines were greatest in the Low Countries and Norway, were heavy in Germany, Austria, France, and Switzerland, and least in Hungary, Rumania, Bulgaria, Portugal, Spain, Italy, and Czechoslovakia, countries normally or practically self-sufficient as to grain production. Within a few weeks after the close of the war, substantial shipments from overseas countries of fats and smaller amounts of canned and dried milk and meat will be needed.

Foreign Agriculture, [September 1944] (*U. S. Dept. Agr., Foreign Agr., 8* (*1944*), *No. 9, pp. 193–212, illus. 3*).—An article entitled Trends in Foreign Agricultural Policies, by L. A. Wheeler (pp. 195–198), describes the developments of the agricultural policies of the British Empire, Latin America, and other countries, and their significance. An article on the Agriculture of Nicaragua, by K. H. Wylie (pp. 199–212), describes the physical and economic characteristics, development and present status of agriculture, Government policies affecting agriculture, and the effect of the war on Nicaraguan agriculture.

The Hot Springs resolutions and their bearings on British agriculture, J. RUSSELL (*Scot. Jour. Agr., 25* (*1944*), *No. 1, pp. 1–8*).—A discussion of the resolutions of the United Nations Conference on Food and Agriculture held at Hot Springs, Va., May 18–June 3, 1943 (E. S. R., 89, pp. 739, 755).

Land reform in Puerto Rico, S. L. DESCARTES (*Jour. Land and Public Util. Econ., 19* (*1943*), *No. 4, pp. 397–417*).—Land reform in Puerto Rico has affected a perceptible but not considerable area of farmland. The activities of all public land reform agencies, plus one privately sponsored project, have resulted in the acquisition for distribution or in the supervised redistribution of about 108,000 cuerdas (104,868 acres), or 5.7 percent of the total area in farms reported by the 1940 Census. Of large estates belonging to sugar companies or related interests, 35,000 cuerdas have been included in the program. This constitutes 8.8 percent of the estimated 400,000 cuerdas operated by sugar companies and related interests in 1934–35 before the programs affecting these landholders were started.

Land reform commenced in Puerto Rico very modestly in 1921, with the establishment of the Insular Homestead Commission, which agency purchased farms usually from private persons, in most cases located in interior areas of medium and low productivity, divided them into small farms, and assigned them to agricultural laborers either on a rental basis or on the basis of gradual acquisition through the amortization of the value of the farm. This commission established 2,074 farms aggregating a total of 24,000 cuerdas.

The Puerto Rico Reconstruction Administration was set up by the Federal Government in 1935, and to June 30, 1943, had created 995 farms and 10,026 subsistence farms, redistributing a total area amounting to over 44,000 cuerdas.

In 1938 the Farm Ownership Program, known as the Tenant Purchase Program, of the Farm Security Administration was extended to the Island. From then to the present that agency has created 491 farms, each capable of sustaining a family at a satisfactory level of living. The land area involved aggregates 17,800 cuerdas. In 1941 the Insular Legislature enacted legislation which created a public instrumentality to carry out the long-desired enforcement and implementation of the prohibition on corporations to operate land in excess of 500 acres imposed by the Congress of the United States.

A summary and appraisal of Texas real property tax laws, W. R. PARKS, L. P. GABBARD, and H. C. BRADSHAW. (Coop. U. S. D. A.). (*Texas Sta. Bul. 645* (*1944*), *pp. 37*).—The legislation in effect at the end of the calendar year 1944 with citations is outlined. Included are the laws on property subject to tax, taxing units and tax officials, assessment, payment of current taxes, and collection of delinquent taxes. A final section appraises the legislation and makes suggestions for improvement.

Purchasing in Texas counties, H. C. BRADSHAW and E. J. HERVEY (*Texas Sta. Bul. 653* (*1944*), *pp. 16*).—Detailed examinations in 4 counties were made of purchasing records, including analysis of bids and use of and compliance with specifications for road, bridge, and general purchases, and less detailed examination in 10 other counties. Good purchasing practices are discussed and the practices in the several counties described. Purchasing in small counties is also discussed.

The use of good practices in the counties studied reduced the costs of materials, supplies, and equipment and the annual expenditures 15 to 20 percent. If equally good practices were used by all counties of the State, it is estimated that the total saving would be 5 to 6 million dollars, of which about 3½ million would result from reduced unit costs and the remainder from a reduction in the total amounts of materials used. The savings would be approximately 10 percent of the total annual costs of county government.

Changes in milk collection situation, Knoxville milk shed, 1943 to 1944, B. H. LUEBKE and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 174* (*1944*), *pp. 25+, illus. 11*).—This monograph supplements Monograph 162 (E. S. R., 90, p. 700).

Increasing the market outlets for Louisiana winter vegetables through mixed shipments, P. T. ECTON (*Louisiana Sta. Bul. 382* (*1944*), *pp. 15, illus. 5*).—Data as to the contents of mixed car and truck shipments were obtained from railway waybills and inspection certificates for truckloads. The number, content, and destination of single-product and mixed shipments are analyzed and the disadvantages and advantages of mixed shipments discussed.

The chief disadvantages were: Orders must be received before loading; costs of assembling and loading are higher; movement of mixed cars confuse market information, as contents are not reported by the crop reporting service; the time of peaks of quality of different vegetables vary; and the diversion of shipments is difficult. Among the advantages are: Direct shipments to smaller towns, costs to smaller cities lowered as cartage and rehandling at terminal markets is saved, shipments can be handled in terminal markets more quickly by smaller brokers, new vegetables can be introduced more easily, carlot volume can be obtained more easily at the beginning and end of the seasons, and the risk of price declines is spread.

Florida farm prices, A. H. Spurlock and C. V. Noble (*Florida Sta. Bul. 399 (1944), pp. 106, illus. 20*).—Tables and charts usually covering the period 1909–44 are included and discussed, showing annual or monthly prices, or both, for different farm products or groups of products, indexes of purchasing power of products or groups of products, prices paid and received by farmers in the United States, Florida farm real estate values and taxes, freight rates, wages, etc. Comparisons are made of the prices of farm products in Florida with those for the United States, California, North Dakota, Iowa, Alabama, Pennsylvania, and Wisconsin. The method used in computing the indexes for Florida is described.

Livestock prices at New Orleans stockyards, Arabi, Louisiana, 1925–43, J. M. Baker (*Louisiana Sta., Agr. Econ. Mimeog. Cir. No. 40 (1944), pp. 41+, illus. 16*).—Yearly and monthly prices are included for different kinds of cattle, hogs, sheep, and lambs.

Trends in prices of purebred cattle, A. A. Dowell (*Minnesota Sta. Bul. 380 (1944), pp. 16, illus. 10*).—Using data from *Crops and Markets* and U. S. D. A. Statistical Bulletin 20 (E. S. R., 58, p. 81), breeder associations and their journals, and other sources, a series of weighted averages of prices were constructed for two breeds of beef and four breeds of purebred dairy cattle. The long-time trends, First and Second War prices, variations within years, prices of males and females, factors affecting the prices, and future prospects are discussed.

General trends for purebred beef and dairy cattle were similar. The prices for beef cattle had a much greater fluctuation than those for dairy cattle, rising much higher in the World War I boom and falling much lower during the depression of the early 30's. There was a tendency for the rise to begin a year earlier. The indexes for purebred dairy cattle follow those of butter quite closely for the period 1916–42 except from 1923–28 when they were considerably higher. The relationships with milk cow, farm real estate, and wholesale prices were less close.

Year book of agricultural co-operation, 1943–44, edited by The Horace Plunkett Foundation (*Manchester: Co-operative Wholesale Society, 1944, pp. 298, illus. 1*).—Included are the following papers presented to the British Association Conference on Co-operative Systems in European Agriculture held at London, April 1943: Co-operation in European Agriculture, by E. J. Russell (pp. 19–25); The Co-operative Supply of Agricultural Requirements in England, by J. W. Hewitt (pp. 26–30); Agricultural Co-operation in the Crofting Counties of Scotland, by C. J. M. Cadzow (pp. 31–36); Co-operation in Ireland, by M. Digby (pp. 37–42); Systems of Agricultural Co-operation in Pre-war France and Their Post-war Expansion, by A. Dulin (pp. 43–51); Agricultural Co-operation in Belgium, by L. Borremans (pp. 52–55); Agricultural Co-operation in Switzerland, by E. Feisst (pp. 56–62); Co-operative Systems of European Agriculture—Northern Countries; Holland, Denmark, Norway, Sweden, and also Poland, by C. R. Fay (pp. 63–69); Denmark, by P. A. Moltesen (pp. 70–74); Agricultural Co-operation in Poland, by S. Krolikowski (pp. 75–79); Some Aspects of the Agricultural Co-operative Systems in Norway, by A. Fjelstad (pp. 80–86); Co-operative Systems in Dutch Agriculture, by B. Gerritzen (pp. 87–93); The Emergency Distribution of Food, by J. McFadyen (pp. 94–98); Co-operation in Europe and Post-war Reconstruction, by R. A. Palmer (pp. 99–109); The Nutritional Aspect in the Emergency Distribution of Food, by M. Pyke (pp. 110–111); The Co-operatives' Part in Food Distribution, by M. J. Kwapinski (pp. 112–115); Co-operation and Emergency Food Distribution in Czechoslovakia, by R. Kreisky (pp. 116–120); Conditions of Agricultural Co-operation in Yugoslavia and the Chances for a Co-operative System, by R. Bicanic (pp. 121–133); Agricultural Co-operation in Czechoslovakia, by F. Hodza (pp. 134–142); Agricultural Co-operation in Greece, by G. Polychroniades (pp. 143–153); and Soviet Agricultural Co-operation, by N. Barou (pp. 154–160).

Also included are the following papers and comments: Agricultural Co-operation in the United States, by J. G. Knapp (pp. 161–188) (U. S. D. A.); Canada—The Prairie Provinces, by J. T. Hull (pp. 189–202); Impressions of Agricultural Co-operation in England, by J. McFadyen (pp. 203–205); Agricultural Co-operation in England, 1941–43, by H. A. Izant (pp. 206–213); Agricultural Co-operation in Ireland, by H. F. Norman (pp. 214–223); The Coming of Age of the Welsh Agricultural Organisation Society (1922–43), by R. O. Rowlands (pp. 224–237); Co-operative Progress in Western Australia, by T. H. Bath (pp. 238–241); Co-operation in Nigeria, by W. J. W. Cheesman (pp. 242–247); Cyprus (pp. 248–252); The Co-operative Movement in Palestine During the War, 1939–43, by H. Viteles (pp. 253–275); Entr'acte in Malaya, by A. Cavendish (pp. 276–278); Co-operation in the Dutch East Indies, by J. S. Furnivall (pp. 279–281); Agricultural Education, by H. G. Fay (pp. 282-288); and Co-operation, Relief, and Reconstruction, by M. Digby (pp. 289-298).

Handbook on major regional farm supply purchasing cooperatives, 1942 and 1943, J. G. KNAPP (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 73 (1944), pp. 53+, illus. 1*).—"This handbook is designed to present concise, comparable information for each of the 17 major regional farm supply purchasing cooperatives in the United States, for their fiscal years ending in 1942 and in 1943 (part I), and to combine and analyze such information as a means of showing the character and significance of these associations as a group (part II)."

Significance of the patronage dividend as applied by cooperative cotton gin associations, W. E. PAULSON and R. T. BAGGETT. (Coop. U. S. D. A.). (*Texas Sta. Bul. 649 (1944), pp. 30*).—The sources and disposal of profits, the objectives of patronage dividends and the problems of determining equitable patronage dividends due to the several types of business conducted by a gin, and the profit and non-profit aspects are discussed. The running bale, lint cotton, seed cotton, and departmental and semi-departmental plans of computing dividends are described and the equitableness of each discussed. The methods of computing dividends used by three associations are discussed and compared. Exhibits include letters of two former managers on the development of a departmental dividend plan and forms used by four associations in patronage dividends to association members.

Farmers' cooperatives and the Federal income tax statutes, K. B. GARDNER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 75 (1944), pp. 14*).—The requirements for exemption and proof of exemption are described. Brief statement is made regarding the exemption from other Federal taxes.

RURAL SOCIOLOGY

Bibliography of the Department of Rural Sociology, Cornell University, W. A. ANDERSON (*N. Y. State Col. Agr., Cornell Univ., Dept. Rural Sociol. Mimeog. Bul. 15 (1944), pp. 24+*).—This is a list of the publications in the field of rural sociology by members of the staff at Cornell University. It is presented by authors and by subjects.

Some efforts of rural sociology in the present war, O. LEONARD. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 2, pp. 142–151, illus. 2; Span. abs., p. 142*).—Demands ushered in by the war upon governmental administrative personnel have brought about an increased realization of the existence and importance of many social facts upon which efficient and effective mobilization of rural people for concerted action must depend. A recent experience in the establishment and studies of an organization purporting to reach every rural family in the States of New Mexico and Utah demonstrated this recognition, since the organization progressed more rapidly and functioned more satisfactorily where natural groupings or existing patterns of association, locally established leaders, and attitudes and values of the people being mobilized were recognized and utilized.

The neighborhood as a unit of action in rural programs, B. Ryan. (Iowa State Col.). (*Rural Sociol., 9 (1944), No. 1, pp. 27–35; Span. abs., p. 27*).—It is suggested that our concept of the strong neighborhood has been given an unduly idyllic emphasis, and that the appropriateness of this unit for action programs has been diminishing rapidly due to the secular trend in American rural life. Further evaluation, however, may lead us away from the utilization of familistic spatial groups toward more functional grouping in the organization of secular rural programs. The paper is followed by a discussion by R. Heberle (pp. 35–36) (La. State Univ.), with a rejoinder by Ryan (pp. 36–37).

Developing local leadership in agriculture's war effort, T. W. Longmore and T. G. Standing. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 1, pp. 44–49; Span. abs., p. 44*).—It is maintained that effective leadership should not be implanted from without but rather emerged within the natural neighborhood and community. A functional leader who is not an independent factor in the chain of social causation should secure a natural setting where he could maintain a directive and personal relationship with his people and strive to meet the felt needs of his group.

Postwar planning at the community level, W. E. Grimes (*Kansas Sta. Cir. 225 (1944), pp. 10*).—This publication discusses the community's goal, the strengthening of established industries, the establishment of new industries, homemaking, and the relation of agriculture to the community.

Selected social factors affecting participation of farmers in agricultural extension work, C. R. Hoffer (*Michigan Sta. Spec. Bul. 331 (1944), pp. 39, illus. 3*).—In this second study (E. S. R., 86, p. 412), it was found that participation on an individual basis is positively associated with participation in groups. Hence, these types of participation are supplementary rather than competitive. A county agricultural agent who is successful in having participation on a group basis may expect also an increase in participation on an individual basis. 4-H Club activities were related positively to adult activities in the extension program, but a relatively small amount of emphasis was given to this work by some county agricultural agents.

A considerable amount of variation in participation on the part of farm people was found among the different counties of the State. There was evidence that the type of program sponsored by the county agricultural agent was important in this connection, for if a program emphasized meetings and other activities which encouraged participation the rating was higher than in a county where the agent worked for some other objective. Also, the effort an agent puts forth to obtain participation was an important, but not a determining influence. Socio-economic factors, especially nativity of the farm population, percentage of farm ownership, and percentage of farmers doing business with or through cooperative organizations were positively related to participation. Certain other factors, such as education of the farm population, percentage of first-class land in a county, and ownership of an automobile did not show a positive relationship with participation. The study provides also a rating scale for participation and one for effort as well as an expectancy rating of the response farm people in each county are likely to make to the extension program. It is stated that "these may be useful to agricultural agents and other extension workers in planning and evaluating their work."

Village growth and decline, 1930–1940, E. deS. Brunner and T. L. Smith (*Rural Sociol., 9 (1944), No. 2, pp. 103–115; Span. abs., p. 103*).—In every population group studied except those with less than 250 population, over two-fifths of the villages gained or lost less than 10 percent between 1930 and 1940. Fifty percent more places gained up to 10 percent as lost up to that proportion. There was little variation in the proportion of each size group villages above 250 gaining specified percentages. The recent data on village population behavior suggest the hypothesis that there may be emerging in the United States two distinct types of service centers for the rural population. One of these is the traditional type of service station village. The other is the "market town" of 2,500 to 10,000 or even larger population, which though less rural than formerly extends the number and enlarges the scope of its services to the farming population as it grows.

Socio-economic evolution in a timbered area in northern Michigan (a case study of Cheboygan, Michigan, 1899–1940), D. L. GIBSON (*Michigan Sta. Tech. Bul. 193 (1944), pp. 76, illus. 12*).—The author dicsusses the history of Cheboygan as a boom town in 1890, and especially what happened after 1900 when the lumber industry began to decline in the area.

Problems of rural society in Brazil, A. CARNEIRO LEÃO (*Rural Sociol., 9 (1944), No. 2, pp. 170–177; Span. abs., p. 170*).—Brazil, a country of great territorial extension and low density of population, is depicted as the first great experiment at building a civilization in the Tropics. Erroneously most of the difficulties and setbacks have been attributed to climate and race, but there are no uninhabitable areas on the earth and the degeneration of supposedly superior racial types indicates that the problem is cultural. With proper housing, diet, and sanitation it is maintained that man can develop all of Brazil. Brazilians themselves are the moving forces in the development of the nation's civilization.

The plight of education in rural Panama, O. HOOPER, trans. by E. MOORE (*Rural Sociol., 9 (1944), No. 1, pp. 50–56; Span. abs., p. 50*).—Although 67 percent of Panama's population are not industrialized, all existing school systems have been set up for people living in a money economy. As a consequence, the country children acquire little useful knowledge by attending the few schools which are available. Pieces of necessary information are gathered here and there, such as essential knowledge from parents; many things from actual experience; and further contributions from contacts with other country people and with visitors from the outside world. If the Panamanian school system is to be effective for the great bulk of rural population, it is argued that its methods must be revised to meet the daily needs of the farmers.

The educational preparation of Louisiana's farm people (*Louisiana Sta. Rpt. 1943, pp. 105–106*).—It is stated that Louisiana's farmers have far less formal education than has been provided to the village, suburban, and urban portions of the State's population. The median number of years of schooling secured by the native white population resident on farms is only 6.3, while in rural nonfarm areas the comparable figure is 8.1, and in urban areas 9.1. Among Negroes the median years of schooling increases from 2.8 on the farms to 3.5 in rural nonfarm areas, to 5.2 in urban districts. Both the white rural-farm population and the Negro rural-farm population of Louisiana are exceeded by all other States as to average amount of schooling obtained.

Migration: A problem of Utah youth, J. A. GEDDES. (Coop. U. S. D. A.). (*Farm and Home Sci.* [*Utah Sta.*], *5 (1944), No. 3, pp. 9, 17-18, illus. 1*).—The author concludes that although war conditions have changed employment opportunities in the State, peacetime conditions may bring back many of the population problems existent before the war.

Military service and migration to industry as factors in the labor shortages in the Sugar Cane Belt since 1940 (*Louisiana Sta. Rpt. 1943, p. 104*).—Since most whites in this area, even when living in the open country, are classified as nonfarm, they have not been eligible for agricultural deferent. Consequently, in filling quotas from local manpower pools, every available white man without dependents had to be called. Negroes of draft age have remained in the rural community much more frequently than whites, because (1) they are far more likely to have an agricultural occupation and to be eligible for deferment, (2) they are much more likely to be classified as 4-F when examined, (3) they are much less likely to have dependents and, therefore, must rely upon agricultural deferment, and (4) if they leave agriculture, they know the planters must inform the draft board. Those Negroes of draft age who are never examined and, therefore, not classified as 4-F, tend to remain in agriculture. Critical labor shortages on some of the larger plantations have been partly offset by greater use of machinery, especially in harvesting, and by limited use of war prisoners. There has been no relief for smaller operators, and none appears likely. Informed planters are of the opinion that farm deferment must be continued, but they feel that the unit basis is not satisfactory, since the operator of a small farm should be entitled to deferment.

Farm ownership status of parents as a determinant of the socioeconomic status of farmers, R. T. McMillan. (Okla. Expt. Sta.). (*Rural Sociol., 9 (1944), No. 2, pp. 151–160; Span. abs., p. 151*).—This paper analyzes the relationship between the socioeconomic status of farmers and the farm ownership status of their parents. Using as a basis for study 618 married couples living on farms in selected counties of Oklahoma, it was found that farm tenure status tended to be transmitted from one generation to the next, marriages were highly endogamous with respect to farm ownership status, and couples whose parents were farm owners generally possessed a higher socioeconomic status as measured by 20 items than those whose parents were nonowners. The farm ownership status of the wife's parents proved to be as important as that of the husband's parents in determining the relative status of married couples, excepting that women tended to marry up the tenure ladder and husbands received inheritances somewhat more frequently than wives.

The ages of Louisiana's farm owners (*Louisiana Sta. Rpt. 1943, pp. 106–107, illus. 1*).—During the last 40 yr., the age of Louisiana's farm owners has greatly increased. In 1910 only 9.6 percent of those classed as full owners were 65 yr. of age or over. By 1930 the corresponding percentage was 13.8, and by 1940 it had risen to 16.5. On the other hand, in 1910 some 23 percent of those Louisiana operators who owned all their farming land were less than 35 yr. of age, while by 1940 only 15 percent fell in this younger age group. Louisiana farm owners averaged 50 yr. of age in 1940.

Some regional variations in levels and standards of living, E. A. Schuler. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 2, pp. 122–141, illus. 5; Span. abs., pp. 122–123*).—Three graphic methods (simple curve, bar chart, and scatter diagram) were used to analyze and compare levels and standards of living of farm, rural-nonfarm, and urban families. Illustrative data were taken from Consumer Purchases Study publications. The expenditure categories represented were: Household help, dentist's services, kitchen sink with drain, reading material, and religious organizations. The scatter diagram was found to show most clearly and simply the cultural roles played (i. e., necessity, luxury, rarity, and substitute) by various items. It was thought the procedures presented should be particularly useful in analyzing and comparing the value systems held by various population categories, such as rural and urban, regional, race, and tenure.

Parity prices vs. standards of living as a goal for agricultural improvement, O. V. Wells. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 2, pp. 115–122; Span. abs., p. 115*).—Parity prices are deemed well worth while so far as commercial farmers are concerned, but for perhaps one-half of the farm families in the United States the real need is for some assurance of more varied food, better medical care, adequate education, and some funds which can be freely used. A minimum standard of living—or the content of an adequate standard of living at minimum cost—for farm families should be worked out. A single generalized standard with certain variations could be used as a basis for measurement and as a goal for agricultural improvement along with such other goals as "parity prices" and "soil conservation."

Rural health as a field of sociological research, O. D. DUNCAN. (Okla. A. and M. Col.). (*Rural Sociol., 9 (1944), No. 1, pp. 1–10; Span. abs., p. 1*).—This paper outlines rural health as a field of rural sociological research in terms of broad suggestive problems of study which are capable of being broken down into many detailed research projects, appraises briefly the methods of research which are likely to be the most fruitful in making sociological investigations of rural health, and surveys the position of rural sociology in health research.

How can better rural health be developed? L. S. KLEINSCHMIDT. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 1, pp. 21–27; Span. abs., p. 21*).—Surveys of the rural health situation indicate a large proportion of farm families have poorer health, that facilities for health service are below normal requirements, and that there is an inadequacy of care provided regularly for the lower-income families. An approach to the solution of the rural health problem depends on the family, the community, and the adequacy of facilities in a logical "health service area" large enough to include all needed facilities and justify economical administration.

Health and mortality of the population of Louisiana (*Louisiana Sta. Rpt. 1943, p. 107*).—Data have been assembled which permit comparisons of rates of mortality in the State with those in the United States for the period 1925–40 for "all" and for "specific" causes of death. The trend in the general death rate has been downward in both areas, with the most pronounced reductions in rates from the communicable or preventable diseases. Rates from these causes were still higher in Louisiana in 1940 than they were in the country as a whole in that year. The degenerative diseases, or those associated with older age groups in the population, increased in importance as causes of death in both areas over the period, and rates of death from these causes were, in general, higher in the nation as a whole than in the State in 1940. Within the State, much of the improvement was due to the lowering of Negro death rates, and especially those from communicable diseases. Even so, this race was characterized by a general death rate which was 1.5 times as high as that of the white population of the State in 1940.

New books by and about Negroes, C. B. SHERMAN. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 2, pp. 161–169; Span. abs., p. 161*).—Beginning late last summer an outpouring of books of many kinds, both by and about Negroes, is noted. They include social and economic considerations of problems and proposed solutions, but the larger number are in biographies, personality sketches, vivid portrayals of present-day Negro life, discussions of advancement made thus far in diverse fields, and a variety of novels in which the stresses of Negro life and the plight of the mulattoes play a dramatic part. The spontaneity of this outburst of popular literature is deemed notable and the causes are readily discernible.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural science to serve youth, W. P. EVEROTE (*Columbia Univ., Teachers Col., Contrib. Ed., No. 901 (1943), pp. 79+*).—The study describes and evaluates an experimental course in chemistry in the Susan Miller Dorsey Senior High School, Los Angeles, California, from September 1938 to June 1942, developed around a series of problems important to the youths in the community. Chapters discuss the grade-point study, the selection of agriculture as a problem to be studied, and analyze the class and term problem data secured. As a basis for the presentation of the main problem areas, the students were grouped on the basis of post-high-school plans. Eight problem areas were selected—minerals, water supply, cosmetics, photography, petroleum, food, agriculture, and textiles. In addition to group activities in class, plans were made for each student to work intensively on a special problem. The records of the students who had taken the experimental course were compared with those of an equal number of students who had a control-chemistry course, pairs from the two groups being matched on the basis of intelligence quotients.

Needed changes in teaching entomology, E. O. ESSIG (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 563–565*).—An editorial.

An educational approach toward the revision of service courses in economic entomology, J. R. EYER (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 565–568*).—An editorial.

OES eighth reader, S. L. SMITH and G. ADAMS. (U. S. D. A.). (*Jour. Home Econ., 35 (1943), No. 3, pp. 163–164*).—This is a list of the State agricultural experiment station publications bearing on research of interest to home economists and appearing in 1941–42. The subjects covered include foods and nuitrition, textiles, housing, and family economics and family life.

OES ninth reader, S. L. SMITH and G. ADAMS. (U. S. D. A.). (*Jour. Home Econ., 36 (1944), No. 3, pp. 154–156*).—This list, similar to the one noted above, covers publications appearing in 1942–43.

FOODS—HUMAN NUTRITION

Quality of beef, I–IV (*Kansas Sta. Tech. Bul. 58 (1944), pp. 86, illus 2*).—Four studies are presented.

I. *Mineral constituents of blood, muscle tissue, and fat tissue of beef animals and their relation to keeping quality,* H. W. Loy and J. L. Hall (pp. 7–21, 79).—This phase of the study included a broad investigation of the mineral elements in the blood and tissues of widely different grades of beef animals. Ripening shrinkage was apparently dependent upon mineral constituents and on fat covering. No correlation could be detected between the total mineral constituents of meat and its keeping quality, except to a limited extent in the adipose tissue. This tissue in animals receiving low-P grass had a low P : N ratio as compared with lots receiving corn. The effect of P intake on Ca retention was reflected in the relatively high Ca : N ratios in the fat of corn-fed animals. The poor keeping quality of meat from animals on low-P grass, as compared with meat from animals receiving grass of normal-P content, indicated that this element in the ration had an important relation to the keeping quality of the meat.

II. *Effect of dietary phosphorus deficiency on quality of beef,* J. L. Hall, D. L. Mackintosh, and G. E. Vail (pp. 22–39, 79–80).—Yearling steers on a low-P ration developed definite symptoms of P deficiency, as shown by blood and bone analyses. Rib roasts from these animals had less desirable qualities regarding texture, flavor of lean, juiciness, and aroma and intensity of flavor of fat than roasts from pair-fed animals on a high-P ration; the former, as compared with the latter, were judged less tender (although mechanical-shear measurements of tenderness and collagen content did not show this), showed somewhat more spoilage after 28 days' ripening, required greater cooking time per pound, and showed higher cooking losses. Rib-eye samples from the low-P animals yielded the greater amount of press fluid (obtained by use of a Carver laboratory press) and a higher amount of Ca in this fluid, in spite of the fact that the whole tissue contained less Ca than the high-P samples. No significant color differences were observed in the samples and no shady or dark-colored specimens appeared. Fat tissue was more affected than muscle tissue by the P-deficiency. On the whole the P-deficient beef was inferior to high-P beef in palatability, keeping quality, and shrinkage loss.

III. *Effect of feeding limestone supplement on quality of beef,* J. L. Hall, D. L. Mackintosh, and G. E. Vail (pp. 40–54, 80–81).—Pair-fed yearling steers on high and low levels of Ca showed insignificant differences in blood Ca and P, in palatability and tenderness (mechanical-shear test) of rib roasts, in quality of press fluid and Ca : P relation therein, and in gross composition or P : Ca : N relationships in outside rib-fat tissue. After ripening 21 days, rib cuts from the high Ca lot appeared to have suffered slightly less spoilage, but shrinkage losses, cooking time, and cooking losses appeared to be dependent on outside fat covering. In general, the differences in the quality of beef from steers on low- and high-Ca levels were insignificant, although the high-Ca animals showed greater gains in weight and bone strength.

IV. *Characteristics of dark-cutting beef: Survey and preliminary investigation,* J. L. Hall, C. E. Latschar, and D. L. Mackintosh (pp. 55–78, 81–82).—Characteristics of dark-cutting beef muscle tissue were found to be: High pH, low glucose, practically no glycogen, high inorganic phosphate, low oxidation potential, and rapid oxygen uptake. The most significant differences in properties in dark beef and bright beef appeared to be lower amounts of lactic acid in dark beef.

Further studies on the comparative value of butter fat, vegetable oils, and oleomargarines, R. K. Boutwell, R. P. Geyer, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 6, pp. 601–609*).—In continuation of the study of the relative growth-promoting properties of butterfat and vegetable oils for young rats (E. S. R., 89, p. 758), experiments were conducted in which the ration used contained 48 percent carbohydrate, 26 percent fat, 20 percent casein, 4 percent salts, and adequate vitamin supplements. When lactose was the sole carbohydrate in the diet, the rats fed butterfat or lard made better weight gains than those fed corn oil, coconut oil, cottonseed oil, soybean oil, peanut oil, olive oil, and hydrogenated cottonseed oil. The significance of these results with respect to "filled milks" is discussed. The kind of carbohydrate influenced the weight gains, however, since a carbohydrate mixture modeled after the mixed carbohydrate diet such as man ordinarily consumes (sucrose, starch, dextrose, dextrin, and lactose) permitted growth on the vegetable oil diets equal to that on diets with butterfat or lard. Moreover, the growth rate with every fat or oil was greater when the mixed carbohydrate was fed than when the lactose ration was used. The greater weight increase on the mixed carbohydrates was due to greater deposition of fat in the animal body, as indicated by gross analysis of the rats.

In tests in which the fat of the ration was a properly fortified oleomargarine (three of animal and four of vegetable origin tested), the growth response over 6 weeks was equal to that observed with butterfat, provided the carbohydrate mixture was incorporated in the ration. It is stated that these results offer no conclusive evidence that on a mixed carbohydrate diet such as man ordinarily consumes oleomargarines are inferior to butterfats. When lactose was the sole carbohydrate of the diet however, the properly fortified oleomargarines did not give growth equal to that produced by the butterfat. On such a regime the rats fed butterfat grew slightly better than rats fed oleomargarines of animal origin but decidedly better than rats fed oleomargarines of vegetable origin.

Questions and answers on enriched corn meal, flour, bread, and grits (*South Carolina Sta. Misc. Pub., 1943, pp.* [5]).—The material, presented in very popular form for educational purposes, explains what the enriched products are and tells why this enrichment is considered so desirable as to be required by law for flour and bread in South Carolina, Alabama, Louisiana, and Texas and for grits and degerminated corn meal in South Carolina and Alabama.

Cookies made with honey at high altitudes, E. J. Thiessen. (Wyo. Expt. Sta.). (*Amer. Bee Jour., 83 (1943), No. 5, pp. 206*).—At high semiarid altitudes, honey may be used very successfully in cooky recipes, since its hygroscopicity prevents the cookies from drying out as quickly as with sugar. Several recipes especially adapted for use at high altitudes are presented.

Calcium, phosphorus, and iron content of Minnesota vegetables, E. G. Donelson, J. M. Leichsenring, D. A. Grambow, and L. M. Norris. (Minn. Expt. Sta.). (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 5, pp. 344–345*).—Calcium, phosphorus, and iron were determined by methods noted in root vegetables grown in four communities in the western part of Minnesota and in three communities in the Iron Range. The samples were handled with precaution to avoid iron contamination. The data presented for the several samples of beets, cabbages, carrots, onions, potatoes, and rutabagas show that consistently lower values were obtained for the pared vegetables than for the unpared samples, that samples of a given vegetable from different places in any one region may vary appreciably in the content of any one element, and that the high iron content of the soil does not necessarily predicate an increased amount in the vegetables.

Some mineral constituents of the edible portion of Scuppernong grapes, M. Kramer and G. H. Satterfield. (N. C. State Col. et al.). (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 6, pp. 431–432*).—Samples of Scuppernong grapes grown in the region of Raleigh, N. C., in 1939, were washed, squeezed by hand, and freed of skins and seeds, preparatory to analysis as to moisture, ash, Ca, Mg, Fe, Al, Cl, Mn, and P, by A. O. A. C. methods. Data presented for the edible portion (pulp and juice), on the fresh and dry bases, indicate that this grape is not a rich source of the minerals determined.

The influence of venting on pressure cooker performance, W. B. Esselen, Jr. (Mass. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 3, pp. 143–146*).—This paper reports a survey of present recommended practices in the venting of pressure cookers in home canning and preliminary results on an investigation of the effects of different venting procedures on the temperature variations inside the pressure cooker during processing at 10 and 15 lb. pressure and with different loads of pint and quart jars filled with water.

Examination of the instructions given in a total of 62 home-canning bulletins and circulars issued by the U. S. Department of Agriculture, U. S. Department of Interior, the extension services of the 43 States and Alaska, and four manufacturers of home-canning supplies revealed a decided lack of uniformity, in some cases the instructions varying in different publications within a State. Venting times recommended ranged from 2 to 10 min. In the studies reported, it was assumed that the pressure cooker had started to vent when steam escaped freely from the open vent or petcock with an audible sound. With the 11-qt. or small-size pressure cooker, uniform temperatures within the cooker indicating that the entrapped air had been completely driven out were obtained in 4 min. at both 10 and 15 lb. pressure. With the 25-qt. size, longer times were required and it was difficult in some cases, particularly with a full load of pint jars, to obtain uniform temperatures without boiling the water in the cooker for some minutes before sealing the cover in place. On the basis of data thus far obtained, the author recommends a venting time of at least 10 min. for pressure cookers of the size commonly used in home canning, with the further precaution when processing pint jars, particularly, of allowing the water to boil for 10 min. in the cooker before sealing in addition to the 10-min. venting time.

Venting pressure cookers: A warning, M. C. Pfund. (Cornell Univ.). (*Jour. Home Econ., 36 (1944), No. 6, pp. 337–338*).—The author expresses the opinion that the recommendation of Esselen noted above of a venting time of at least 10 min. for a pressure canner of the size commonly used in home canning may be unnecessarily long, and suggests that before accepting the recommended procedures "it would be well for each canner to consider them in relation to the total canning process that is being followed in order to ascertain whether the likelihood of underventing, with the subsequent possibility of underprocessing, exists. It is well also to remember that if no spoilage has been occurring in home-canned vegetables processed under pressure, the processing times now in use probably provide a sufficient margin of safety to care for processing temperatures that are 1° or 2° F. below the theoretical temperatures. If so, any additional heating would only serve to further overcook the already long-cooked vegetables."

Venting pressure cookers: Addenda, W. B. ESSELEN, JR. [Mass. Expt. Sta.]. (*Jour. Home Econ., 36 (1944), No. 6, p. 339*).—In this reply to the above note, attention is called to two recent instances of botulism with four deaths in New York State as revealing the presence of dangerous organisms in the soil in a region hitherto considered relatively free from them and to a study of home canning spoilage in Massachusetts, by R. G. Tischer and himself, in which it was found that about 80 percent of the spoilage of canned foods processed in a pressure canner was due to understerilization. The hope is expressed that eventually some pressure canner processing times may be reduced but that, "with many of the present practices in pressure canner operations, a reduction in process times would be dangerous, and increased amounts of spoilage could be expected because of the reduced safety margin of the process."

Light has no effect on commercially glass packed foods, J. J. POWERS, W. B. ESSELEN, JR., and C. R. FELLERS. (Mass. Expt. Sta.). (*Glass Packer, 22 (1943), No. 8, pp. 528–530, 554*).—Raspberries, plums, beets, peas, and green string beans canned in both home-type and commercial vacuum-sealed jars and held for 2 yr. at 70°–80° F. in the dark or upon shelves exposed to a minimum light intensity of 35 footcandles of daylight showed no effects on color, flavor, or vitamin C due to exposure to the light. The quality of the food in metal or commercial-type glass jars was judged the same, and superior to that in home-type jars. The use of *l*-ascorbic acid, or *d*-isoascorbic acid, or *d*-glucoascorbic acid was effective in reducing or eliminating surface darkening of food canned in home-type glass jars.

Factors influencing the quality of home-canned Montmorency cherries, R. M. GRISWOLD (*Michigan Sta. Tech. Bul. 194 (1944), pp. 38, illus. 6*).—Color retention and flavor were best in cherries canned immediately after picking, preferably after 3 hours' soaking in cold, running water. The standard processing time of 25 min. was satisfactory, since shorter periods could not be recommended from the standpoint of safety and longer periods did not improve the fruit. An increase in head space from ¼ to 1¼ in. decreased the quality, particularly as related to color, and addition of increasing amounts of malic acid, citric acid, or lemon juice made the color less intense and lowered the palatability score. The standard cold-pack method produced a better product from the standpoint of color and palatability than pressure-cooking or a hot-pack method, and sugar sirups of 40- or 45-percent concentration resulted in the best palatability scores. Canned underripe cherries had a stronger, more yellowish color, while overripe cherries had a redder, less intense color than fruit of standard ripeness. In a storage period of 17 mo. the color of the canned cherries became weaker and more yellowish. Water-packed cherries compared unfavorably with the standard 50-percent sirup pack in all factors throughout the storage period. A cool storage temperature and preferably a dark place were essential for maintaining quality in storage. Cherries canned in plain tin were very poor, and those canned in enameled tin compared unfavorably with those in glass. Histological sections of cherries in which the pigment had been precipitated before sectioning showed that the anthocyanin of the raw fruit occurred largely in the outer epidermis, while the parenchymatous cells were straw-colored. In the canned fruit the cell walls were swollen and extended, the cells were enlarged, and the anthocyanin was no longer restricted to the epidermal cells. Based on the results of this study, a preferred method for canning Montmorency cherries in glass jars is outlined.

Prevention of precipitation in processed apple juice, R. E. MARSHALL. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1943), No. 2, pp. 40–42, illus. 2*).—In investigations over two seasons, it was shown that clarified and filtered apple juice may be stabilized against visible precipitation, even at room temperature, by addition of small amounts of pectin. Tentatively, it is suggested that 1 oz. of 140 grade apple pectin be added to each 150 gal. of the filtered apple juice that is to be sealed in glass containers. The pectin should be thoroughly mixed with a small quantity of apple juice and the mixture added to the supply tank of filtered juice while the whole is being stirred, just prior to flash pasteurization.

Comments on storage of olives, W. V. CRUESS and R. WHELTON. [Univ. Calif.]. (*Fruit Prod. Jour and Amer. Food Mfr., 23 (1943), No. 1, pp. 10–11*).—Observations are recorded on the keeping quality of bulk unsterilized olives held for 5 mo. in their original brines or in acidified brines with and without a preservative. On the basis of these experiments, it is recommended that "bulk pickled ripe olives for retail sale be packed in brine of 20°–25° salometer containing 2 percent of acetic acid from added 100 grain vinegar and 0.2 percent sodium benzoate (equivalent to about 0.1 percent benzoate at equilibrium of brine and olives after storage for a week or more). The addition of flavoring, namely, garlic, sweet peppers, and fennel, is optional; but these should be added in conservative amounts."

Pretreatment of foods for dehydration, B. M. WATTS. (Calif. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 1, pp. 13–15*).—This is a general discussion of the function and methods of application or use of heat (including blanching and precooking), sulfur dioxide, and antioxidants in the pretreatment of foods for dehydration.

Notes on cabbage dehydration, W. V. CRUESS, H. FRIAR, and E. BALOG. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1943), No. 4, pp. 113–115*).—Experiments conducted at three commercial dehydrators on shredded cabbage sulfited in various ways and compared with nontreated samples showed that concentrations of 0.6 percent of sulfite applied before blanching, or 0.3 percent if applied after blanching, were required for effective treatment against darkening of the samples in storage. Sulfited cabbage withstood, without scorching or development of abnormal flavor, a finishing temperature of 160° F., which was 20° or more above that ordinarily employed for unsulfited cabbage. The sulfite was effectively applied to the cabbage either by spraying or dipping. Preliminary tests indicated that bisulfite might be more effective than sulfite or a 50 : 50 mixture of sulfite and bisulfite in preventing staling of flavor and odor of dried cabbage in storage. Dried cabbage containing initially 2,180-2,500 p. p. m. SO_2 as determined by the Nichols-Reed method, and stored about 4 mo. at room temperature, held its flavor, odor, and color fairly well.

Palatability studies on home-dehydrated vegetables, J. T. STILLMAN, B. M. WATTS, and A. F. MORGAN. (Calif. Expt. Sta. and Univ.). (*Jour. Home Econ., 36 (1944), No. 1, pp. 28–34*).—This study was undertaken to determine the best practices from the standpoint of palatability of the final product in home dehydration, storage, and reconstitution for the table of a number of vegetables. The drying was done in small home evaporators of the natural-draft (kerosene heater) or the forced-draft type without recirculation of air, using a combination electric fan and heater, and was continued until the vegetables were brittle, at which point the moisture content ranged from 2 to 7 percent. For the storage tests the dehydrated vegetables were placed in glass jars with screw-on lids and stored at temperatures of 32°, 65°, and 82° F. For the soaking and cooking tests 250-cc. beakers were used with enough water added to the vegetables to keep them covered during the soaking and cooking period.

All of the vegetables investigated in some detail were much more palatable if blanched long enough to destroy peroxidase. Either steaming or boiling briefly in water or a salt solution proved satisfactory, but steam is recommended because it increases the retention of the vegetable nutrients. Most of the dehydrated vegetables improved somewhat in palatability when soaked before cooking, the optimum times ranging from 1 to 3 hr. Of the three vegetables on which storage observations were made, spinach and broccoli stored well while carrots deteriorated badly. Storage in the coolest place available is recommended. The best of the samples of dehydrated peas, snap beans, and spinach were all superior, particularly the peas, to canned samples of the same lot.

"Of the vegetables investigated, the most promising for home dehydration were greens, peas, and corn—all vegetables which cannot be stored fresh for any appreciable time. If properly dried, these rated practically as high as the fresh product. Several other vegetables—winter squash, carrots, cabbage—also made excellent dehydrated products, but as these vegetables store fairly well fresh and are usually available during the winter, there is less incentive for drying them in the home. Broccoli, snap beans, summer squash, onions, and tomatoes dehydrated fairly successfully. Asparagus was unsuccessfully dried."

Freezing plates for locker plant freezing and farm freezing and storage cabinets, C. W. DuBois and D. K. Tressler. (N. Y. State Expt. Sta.). (*Refrig. Engin., 46 (1943), No. 1, pp. 25–30, 68, illus. 12*).—"A plate-freezing cabinet similar to those used in recently built locker plants was built for studying rate of freezing of food. Curves indicating the rate of freezing of roasts, steaks, and packaged ground beef placed on plate evaporators with and without air circulation are shown. The temperature drop of samples frozen on plates with air circulation was somewhat more rapid than that of samples frozen on plates without circulation. A farm freezing and storage cabinet with but one compartment in which were installed two plates was used in freezing studies. Curves showing the rate of freezing of roasts, steaks, and packaged ground beef placed on the plates to be frozen were obtained. The behavior of air temperature in the cabinets and temperature in the cabinets and temperature of the plates are also shown. Curves showing rate of freezing of roasts, steaks, and ground meats were obtained from another farm freezing and storage cabinet with vertical plates. Freezing on horizontal plates is more rapid than freezing food in contact with vertical plates. A survey of owners of farm cabinets was started to obtain the owner's reaction to present equipment. Most of the data was not significant because of short-time experience of use. Out of the number visited, the average size of cabinets used by them was 24 cu. ft. with an average of five persons using cabinet."

A consumers' guide to U. S. standards for farm products, C. M. Viehmann (*U. S. Dept. Agr., Misc. Pub. 553 (1944), pp. 21+, illus. 11*).—Factors that determine the grades of various farm products now standardized are discussed. The Office of Distribution of the War Food Administration, which is now responsible for this standardization, divides the list of standards of direct interest to the consumer into two fairly well-defined groups.

The first group includes those standards that can readily be used by the homemaker because of the device (stamp) or certificate accompanying the product, or other visual indication of grade. The second group includes those standards that are marked on some goods in wholesale markets and can be used by consumers who buy in large quantities on these markets. In the first group are standards for beef, lamb, veal, poultry, canned chicken and other canned-chicken products, eggs, butter, cheese, rice, honey, and certain fresh, canned, and frozen fruits and vegetables, and dried fruits. In the second group are standards for most of the fresh fruits and vegetables and dry beans and peas. Standards for containers for fruits and vegetables are discussed, and steps in setting up quality standards for farm products are outlined.

Foods and drugs, E. R. TOBEY (*Maine Sta. Off. Insp. 191 (1944), pp. 98–172*).—This report continues the series (E. S. R., 91, p. 93) presenting especially many analyses of raw and pasteurized milk and cream, ice cream, Hamburg steak, oils used in packing sardines, opened and unopened clams, and various drug products.

Report of committee on frozen desserts sanitation, F. W. FABIAN ET AL. (*Jour. Milk Technol., 6 (1943), No. 3, pp. 157–167*).—This report is concerned briefly with the wartime problems involved in continuing the manufacture of ice cream, with problems of sanitary control, and with the effectiveness of the new acid detergents. Proposed methods for analyzing frozen desserts are mentioned.

Laboratory examination of eating and drinking utensils, R. R. FRANCE, J. E. FULLER and W. E. CASSIDY. (Mass. Expt. Sta.). (*Amer. Jour. Pub. Health, 33 (1943), No. 9, pp. 1054–1064*).—This study, undertaken to make some contributions to the subject of methods and proposed standards for the examination of the efficacy of sanitation in restaurants, fountains, etc., presents the results of experiences dealing with types of swabs and the methods of their application, nature of suspending fluids, and culture media. Several recommendations are presented as a result of these investigations.

Family food consumption in the United States: Spring 1942 (*U. S. Dept. Agr., Misc. Pub. 550 (1944), pp. 157+*).—This material, published as a part of the study of family spending and saving in wartime (E. S. R., 89, p. 507), conducted by the U. S. D. A. Bureau of Human Nutrition and Home Economics in cooperation with the U. S. Bureau of Labor Statistics, deals with the food consumed at home by housekeeping families and single persons in the United States in the spring of 1942. The quantity of food consumed as a whole and by food groups is noted in detail for urban, rural nonfarm, and rural farm groups, and the nutritive value of the diets is computed from these consumption data and food composition tables. The money value of the food, including that purchased and that produced at home, is also noted.

Nutrition and certain related factors of Spanish-Americans in northern Colorado, M. PIJOAN and R. V. ROSKELLEY (*Denver, Colo.: Rocky Mountain Council on Inter-Amer. Aff., 1943, pp. 19+, illus. 3*).—This study confirms the findings of other investigations that avitaminoses and malnutrition exist among low-income groups. It also reveals that nutritional deficiencies existing among Spanish-Americans in northern Colorado are due in large part to a continued shortage of specific food factors in the diet. There is also an insufficient intake of protein of high biologic value, which may account for a reduction in the surface area of these people. Endemic goiter is likewise prevalent. The study reveals the close relationship between certain cultural and environmental factors and problems related to food patterns. Confirmation is found for the idea that recommendations for improvement in diet must be made in terms of the local situation. Acculturation towards a proper dietary must depend upon the local consumption of available foods high in vitamins or high in proteins of significant biologic value. It must be borne in mind that it is difficult for people of rural low-income groups to adopt or accept the idea of a balanced meal, and this being the case they should be encouraged to consume foods necessary for proper body economy in an over-all period dependent upon time and function.

Vegetable preferences of white and Negro children, D. Dickins (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 9, pp. 1, 7*).—Information furnished by 241 white and 392 Negro children in Mississippi, asked to express their food preferences by checking the three foods best liked in each of six groups of six foods each, indicated that lima beans were the most popular of the vegetables, followed by snap beans, cowpeas, and tomatoes, with the white children, or collards, turnip greens, and tomatoes, with the Negro children. The selections made suggested that serving but one type of vegetable at a meal with rotation of the garden vegetables in the meals would guarantee a better all-round consumption of all vegetables by the children than would be the case if they were permitted to choose, meal after meal, only the vegetables they liked best. Since the children were particularly fond of biscuits, butter, and sirup, it is suggested that they be given that combination as a dessert rather than be offered it as a substitute for vegetables.

Menu-planning guide for school lunches (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, NFC-10, rev., pp. 29+*).—This is a slight revision of a publication noted earlier (E. S. R., 90, p. 413).

The influence of nutrition during pregnancy upon the condition of the infant at birth, B. S. Burke, V. A. Beal, S. B. Kirkwood, and H. C. Stuart (*Jour. Nutr., 26* (*1943*), *No. 6, pp. 569–583, illus. 2*).—This study is a part of the research program of the Department of Child Hygiene of the Harvard School of Public Health on the growth and development of the well child. The subjects, 216 women who had not enrolled in the research center previously, were seen at least monthly through the seventh month of pregnancy, every 2 weeks during the eighth month, and then weekly or oftener. Detailed dietary histories were obtained at the time of the visits to the clinic, and at regular intervals consecutive 3-day records were kept of food consumption and information was secured on food likes and dislikes, the amount of money spent for food in relation to income, and other related items. The diets were evaluated in terms of an arbitrary set of standards, approximating the values later recommended by the National Research Council, and classified as excellent, good, fair, poor, or very poor. Medical pediatric ratings describing the condition of each infant at birth and within the first 2 weeks of life were obtained from the obstetricians.

There were 200 full-term, 9 premature, 5 stillborn infants, and 2 who died within a few hours of birth. Of the total number, 23 were judged to be superior while at the opposite end of the scale were 33, including the stillborn, premature, functionally immature, and those who had marked congenital malformations. The remainder were classified in 2 groups, 1 of 84 considered in good physical condition and the other of 76 in fair condition. Statistically significant relationships were shown between the diet of the mother during pregnancy and the condition of the infant at birth and during the first 2 weeks of life.

It is concluded that if the diet of the mother during pregnancy is poor to very poor, she will undoubtedly have an infant whose physical condition will be poor, while if her diet is good or excellent during pregnancy, the infant will in all probability be in good or excellent physical condition. Although it may happen rarely that a mother whose diet during pregnancy is good will give birth to an infant in poor physical condition, in this report there was only 1 such case out of 216.

Adequacy of a diet eaten by children eight to eleven years of age, F. A. Johnston (*Jour. Amer. Dietet. Assoc., 19* (*1943*), *No. 6, pp. 416–419*).—Data available from an iron metabolism study (E. S. R., 88, p. 411) on the food consumption over a period of 2 weeks of 21 children who were offered free choice of meals containing the protective foods in the amounts usually advised for children were used in calculations of the intakes of the principal food essentials in comparison with recommended daily allowances of the National Research Council for this age group. The diet was so planned as to make available for each child daily 1 qt. of milk, one serving of meat including liver once every 2 weeks, one egg served in various ways, two servings of fruit including one of citrus fruit or tomatoes, two or more servings of vegetable, one or two servings of potatoes, and whole cereal.

The diet for each child equaled or exceeded the allowances for his age in every respect. The fact that some of the children were not quite up to standard weight suggested that their calorie intake might have been increased to good advantage. Only 3 were below the Baldwin-Wood standard for height and weight. It is noted that there were more children (4 out of 21) in excellent nutritive condition, as judged by general appearance, than are found in the usual public school. As was brought out in the earlier report, the hemoglobin values averaged about 13 gm. and the red cell counts approximately 4,000,000.

Nutritional and dietary inadequacies among city children from different socioeconomic groups, M. C. HARDY, A. SPOHN, G. AUSTIN, S. MCGIFFERT, E. MOHR, and A. B. PETERSON (*Jour. Amer. Dietet. Assoc., 19* (*1943*), *No. 3, pp. 173–181, illus. 4*).—Evidence is presented from physical examinations and individual diet records on the prevalence of certain signs of nutritional deficiency and dietary inadequacies among the children examined as noted in an earlier report (E. S. R., 87, p. 888). The subjects numbered 7,363 from 3,922 urban families, representing a wide distribution of socioeconomic conditions in Chicago.

Gross signs suggestive of poor nutrition were exhibited by 60 percent of the children examined. These were more frequent among the Negro than the white children, the differences being particularly marked among children from self-supporting families. Ratings indicative of poor general condition varied by economic status from an average of 48 percent at the relief level to 13 percent at the highest economic level. The rating of the diets was based upon the number of servings of protective foods weekly, the standards of adequacy being the weekly consumption of 5¼ qt. of milk, 24 servings of fruits and vegetables including potatoes, and 7 servings of meat, fish, poultry, and eggs. It is noted that although these standards are lower than the National Research Council allowances, which had not been released at the time of the study, the diet patterns of 72 percent of the children failed to meet the standards set. Dietary inadequacies were common at all ages, ranging from 92 percent at the lowest to 41 percent at the highest economic level. The diets of the Negro children were less adequate than those of the white. Specific dietary deficiencies were least often noted in protein foods and most often in fruits and vegetables. Definite improvement in diet pattern followed a marked increase in the food budget from the use of food stamps.

"The findings serve to show the extensiveness of the nutrition problem in a large metropolitan area and indicate the urgent need for effective community programs for health improvement."

Effect of increasing calcium content of diet upon rate of growth and length of life of unmated females, H. L. CAMPBELL, C. S. PEARSON, and H. C. SHERMAN (*Jour. Nutr., 26* (*1943*), *No. 3, pp. 323–325*).—These experiments, patterned after those of an earlier study (E. S. R., 75, p. 881), except that the females remained unmated, showed that growth of these animals was slightly more rapid on the diet containing 0.34 percent of calcium than on the similar diet containing but 0.20 percent. The increased calcium intake on the former diet resulted in an extension of the life cycle by 63 days or 8 percent (858 as compared with 795 days) over that on the diet of lower calcium content. Moreover, the proportion of cases living to 900 days and over was 45 percent among those of higher, against 31 percent among those of lower, calcium intake. Comparing these results with those of the earlier study, it is pointed out that "a limited addition of calcium to a diet of about minimal adequate calcium content results in equally increased length of life in comparable male and female rats if the latter do not invest the extra calcium in increased reproduction and lactation instead."

The mineral composition of the albino rat as affected by chloride deficiency, E. J. THACKER. (Pa. Expt. Sta.). (*Jour. Nutr., 26* (*1943*), *No. 4, pp. 431–441*). —In a previous report (E. S. R., 88, p. 134), the substitution of bicarbonate for chloride in the diets of rats was shown to diminish their growth, appetite, and energy, and to increase their water consumption and heat production. In the present metabolism study, involving a 70-day paired-feeding experiment, it was shown that the bodies of rats on the chloride deficiency ration (0.02 percent chloride and 0.49 percent bicarbonate) contained less chloride, sodium, and potassium and more calcium and phosphorus than did the bodies of rats on the normal chloride ration (0.28 percent chloride). "The contents of the body gain were less in chloride, sodium, and potassium, and greater in calcium and phosphorus; and the concentration of chloride, sodium, and potassium was less in the total water and water gain without disturbance of the ratio of sodium to potassium. The adjustments of the female rats to a restricted intake of chloride were similar to but not as large as those of the male rats. The percentage retention of the intake of sodium, potassium, calcium, and magnesium was lower for the chloride deficient rats than for the normal controls; while the percentage retention of chloride was much higher for the chloride deficient rats than for the controls."

The destructive action, in vivo, of dilute acids and acid drinks and beverages on the rats' molar teeth, F. J. MCCLURE (*Jour. Nutr., 26* (*1943*), *No. 3, pp. 251–259, illus. 8*).—Rats fed a stock diet containing corn flour 66, whole milk powder 30, alfalfa meal 3, and salt 1 percent were given as the fluid to drink (1) distilled water, (2) dilute hydrochloric acid (pH 1.5, 0.16 percent), and (3) dilute lactic acid (pH 2.4, 0.50 percent). Both food and drink were allowed ad libitum. After intervals of from 42 to 70 days, the rats were sacrificed, and, after autoclaving the heads, the molar teeth were dissected out, dried at 110° C., and weighed. The right lower and upper molars of the rats receiving the dilute hydrochloric acid weighed 34.6 and 19.8 percent less, respectively, than corresponding molars of rats receiving the water; the weights were 25.2 and 8.2 percent lower, respectively, for the rats receiving the dilute lactic acid. These weight losses were indicative of the destructive action of these acids on tooth enamel and dentine, and the results were substantiated by microscopic examinations which showed dissolution to be particularly severe on the lingual surface of the lower molars; the upper molars, apparently because of more limited contact with the drinking fluids, were less severely affected.

In another series of tests young rats on a commercial ration were given (1) water, (2) ginger ale (pH 2.8–3.2), (3) a cola drink (pH 2.6–2.7), (4) grapefruit juice (pH 3.2–3.5), and (5) a cranberry juice cocktail (pH 2.6–2.7). The weights of the molar teeth of the test rats tended to be lower than those of the control rats receiving water. The differences between control and test rats were most pronounced in the lower molar teeth, these having had greatest contact with the drinking fluids, and the cranberry juice cocktail exerted the most corrosive action. The weight data were borne out by microscopic appearance of the teeth. "These results pertaining to rats' teeth in vivo suggest the possibility that oral tooth surfaces may be affected by acid drinking fluids passing through the oral cavity. Any association of these effects with the initiation of dental caries, however, remains to be determined."

The essential animo acids in human nutrition, D. MELNICK (*Jour. Amer. Dietet. Assoc., 19* (*1943*), *No. 10, pp. 685–692*).—This review, based on 120 references to the literature, considers the significance of the essential amino acids, their role for general tissue protein synthesis and formation of blood proteins, and their use in appropriate mixtures for administration in place of dietary protein. From the studies presented, some 19 facts are stressed as worthy of particular emphasis.

Digestibility of certain higher saturated fatty acids and triglycerides, R. HOAGLAND and G. G. SNIDER. (U. S. D. A.). (*Jour. Nutr., 26 (1943), No. 3, pp. 219–225*).—This study was undertaken because of the rather wide differences found in an earlier study (E. S. R., 83, p. 269), between the digestive coefficients of certain fats. Digestion tests following the methods used in the earlier study were conducted on mature male rats with diets containing different percentages of pure saturated fatty acids and corresponding triglycerides. Each fatty acid was mixed with pure olive oil in proportions of 5, 10, 15, and 25 percent and each triglyceride in proportions of 5 and 10 percent, the mixture constituting 5 percent of the diet.

Stearic acid was very poorly absorbed at all levels of intake, the approximate digestive coefficients ranging from 9.4 to 21 percent. Palmitic acid was utilized somewhat more efficiently than stearic acid, the digestive coefficients ranging from 23.8 to 39.6 percent. Myristic and lauric acids were very completely absorbed at the 5-, 10-, and 15-percent levels, but the digestibility was somewhat lower at the 25-percent level. Tristearin gave even lower digestible coefficients than stearic acid, the approximate digestive coefficients being 6 and 8 percent at the 5- and 10-percent levels. Tripalmitin was much more digestible than tristearin and was absorbed much more efficiently than palmitic acid, the digestive coefficients being 84 and 82 percent at the 5- and 10-percent levels. Trimyristin and trilaurin, like their corresponding acids, were very completely absorbed.

Anti-acrodynic potency of seed oils, D. S. ANTHONY, F. W. QUACKENBUSH, A. IHDE, and H. STEENBOCK. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 3, pp. 303–308*).—The antiacrodynic potency of various seed oils as determined by the technics previously described by Quackenbush, Platz, and Steenbock (E. S. R., 81, p. 600) was compared with the linoleic and linolenic acid content of the same oils. The antiacrodynic potency of the oils was found to be in direct proportion to their linoleic acid content unless they contained considerable amounts of linolenic acid, which greatly reduced the curative effect. In the absence of linolenic acid or its presence in only small proportions, doses of the oil furnishing 12 mg. of linoleic acid were curative in 11 of 12 oils tested (the exception being raisin seed oil), while doses equivalent to 4 mg. were not curative.

Further evidence for the existence of specific dietary essentials for the guinea pig, G. J. MANNERING, M. D. CANNON, H. V. BARKI, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Biol. Chem., 151 (1943), No. 1, pp. 101–107*).—In extension of previously noted studies (E. S. R., 89, p. 103), the authors adopted the method employed by Woolley (E. S. R., 88, p. 705) of using linseed oil meal as the source of two of the three unknown factors which appear to be essential to the guinea pig. That linseed oil meal contributed to the nutrition of the guinea pig as noted by Woolley was definitely confirmed, but the clear differentiation of the two factors by ethanol extraction was only partly successful. A third factor was present in grass juice powder and in solubilized liver powder, the quantities required for normal growth in addition to the factors provided by linseed oil meal being 8 and 4 percent, respectively. Yeast, milk, and skim milk powder were fair sources of the factor, which is assumed to be identical with the GPF–3 of Woolley. Evidence was obtained that the factor is not identical with folic acid.

The value of biotin, folic acid concentrates, and liver extract in the diet of rats fed succinylsulfathiazole, B. RANSONE and C. A. ELVEHJEM. (Wis. Expt.

Sta.). (*Jour. Biol. Chem., 151* (*1943*), *No. 1, pp. 109–115*).—An extension of work reported by Nielsen and Elvehjem (E. S. R., 89, p. 505) is presented and summarized as follows: "A folic acid concentrate has been shown to approximate the activity of liver extract in counteracting the effects of sulfasuxidine when the concentrate and liver extract are fed at levels equal in *Streptococcus lactis* activity. Biotin increased the growth rate when fed in conjunction with a folic acid concentrate or liver extract even when insufficient quantities of the concentrate or liver were fed. The decreased growth and leucopenia induced in rats by feeding sulfasuxidine were counteracted by the untreated folic acid concentrate or by the same concentrate autoclaved at neutrality, but not by the concentrate when it had been autoclaved in acid. Xanthopterin fed in conjunction with biotin did not increase the growth rate of rats fed sulfasuxidine."

Development and management of a cotton rat colony, D. B. MEYER and M. MARSH (*Amer. Jour. Pub. Health, 33* (*1943*), *No. 6, pp. 697–700, illus. 4*).—The points considered in this description of a cotton rat colony developed and maintained by the Michigan Department of Health for use in poliomyelitis research are equipment, work schedule, feed, management of breeders, and losses among cotton rats. The diet adopted after trials with a great variety of foods consisted of a mixture of 1 part sunflower seed and 3 parts rolled or whole oats; equal parts of commercially prepared fox and mouse pellets; fresh apples, carrots, tomatoes, or alfalfa cuttings; and water from glass bottles equipped with hanging drop dispensers. Losses encountered have been due to mechanical injury from fighting, improper handling by attendants, alopecia, bacterial infection, internal parasitism, and starvation.

Losses of vitamins in large-scale cookery, C. A. HELLER, C. M. MCCAY, and C. B. LYON. (Cornell Univ.). (*Jour. Nutr., 26* (*1943*), *No. 4, pp. 377–383*).—This paper presents a report of a preliminary study conducted in a large industrial cafeteria to obtain a rough estimate of the losses in vitamins in actual large-scale cookery. Data on the carotene, thiamine, riboflavin, niacin, and ascorbic acid content of the raw carrots, potatoes, and cabbage and the frozen peas, lima beans, green beans, and spinach used in the study are presented, together with data on the vitamin content per serving of the cafeteria-prepared vegetables. Pertinent details concerning the cooking and the vitamin losses are also tabulated for the vegetables prepared. "The losses, in percent, ranged as follows: Thiamine 16 to 64; niacin 2 to 61; riboflavin 22 to 45; ascorbic acid 27 to 90. Changes were then made in the vegetable cookery by decreasing radically the time of cooking large quantities. The time of holding vegetables between cooking and service was also cut to a minimum. Texture, flavor, and appearance were improved. A comparison of the thiochrome and fungus assay methods for the determination of thiamine gave excellent results for analyses in vegetables."

The effect of cooking with and without sodium bicarbonate on the thiamine, riboflavin, and ascorbic acid content of peas, C. H. JOHNSTON, L. SCHAUER, S. RAPAPORT, and H. J. DEUEL, JR. (*Jour. Nutr., 26* (*1943*), *No. 3, pp. 227–239*).—In these experiments an 85-gm. sample of peas, either fresh or frozen, was cooked in 180 cc. of water. When sodium bicarbonate was used 0.22 gm. was added, this being an amount comparable to that used in household cookery procedures; values obtained with this addition were usually below pH 9. In the various tests, the peas were cooked not for equal periods of time, but to the same degree of "doneness." It was found that this amount of soda lowered the time necessary for cooking from 17 to 8 min. for the fresh peas and from 6 to 4 min. for frozen peas. Thiamine, riboflavin, and ascorbic acid were determined, by methods outlined briefly, in the raw peas, the drained cooked peas, and the cooking water. The data previously summarized for thiamine (E. S. R., 88, p. 858) showed the fresh peas to contain

333 µg. thiamine, 168–203 µg. riboflavin, and 23.7 mg. ascorbic acid per 100 gm. Similar values for thiamine (351–408 µg.) and riboflavin (171–200 µg.), but somewhat lower values for ascorbic acid (12.2–20.6 mg.), were found for the frozen peas.

Under the conditions of these tests, the presence of sodium bicarbonate in the cooking water had little if any effect on the vitamin losses, except in one lot of overcooked fresh peas and another of frozen peas partially crushed in the processing; in these there was greater leaching out of the thiamine and greater destruction of it in the cooking water in the presence of soda than in plain water. In intact peas, whether fresh or frozen, approximately 80 percent of the thiamine, 65 percent of the riboflavin, and 45–60 percent of the ascorbic acid were retained in the drained peas after cooking. When the vitamins in the cooking water were taken into account, the cooking losses, if the peas were not crushed or broken, were negligible for thiamine (4–8 percent) and not more than 15 percent for riboflavin, regardless of the cooking method and whether the peas were fresh or frozen; ascorbic acid destruction was not influenced by the method of cooking and was small for fresh peas (1–8 percent) but amounted to 15–20 percent with the frozen peas.

Ascorbic acid in institutional food, K. Daum, M. Aimone, and S. Hollister (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 10, pp. 693–694*).—Fresh and canned vegetables cooked in quantity lots to serve 1,400 people in groups of 400 or 500 were sampled before and after cooking and after holding for 15-, 30-, and 60-min. intervals on the steam table or the electrically heated food conveyors. Under the system of operation employed, the holding period was less than 1 hr. and the maximum time for both preparation and service was never more than 3 hr. Analyses of 6–30 lots of each of the 13 vegetables gave values per 100 gm. of cooked vegetables that were 5.5–44.4 percent lower than the corresponding values for the vegetables before cooking. The cooked vegetables lost from 0.0 to 22.2 percent of their ascorbic acid in the first 15 min. on the steam table or conveyor; losses were not appreciable in the next 15 min., but by the end of an hour had increased until the total loss in cooking and holding resulted in ascorbic acid values from 16.6 to 55.5 percent lower than those for the uncooked vegetables. Canned tomatoes showed the lowest and sauerkraut and potatoes the highest losses.

Adequacy of the industrial lunch and the use of brewer's yeast as a supplement, C. A. Heller, C. M. McCay, and C. B. Lyon. (Cornell Univ.). (*Jour. Nutr., 26 (1943), No. 4, pp. 385–390*).—Cafeteria and lunch-type meals served to one cafeteria in the Brooklyn Navy Yard were sampled for the determination of riboflavin, niacin, and thiamine. The assays indicated that this noon meal usually furnished as much as one-fourth of the day's requirements for these vitamins. Following this preliminary survey, dried brewer's yeast was added to certain of the cooked products, following initial efforts to standardize the recipes and determine reasonable yeast levels that would not injure flavor or appearance of the foods. Addition of the dried brewer's yeast proved a satisfactory method of supplementing the vitamin supply if the additions were made to meat dishes at conservative levels, so that the taste was not detected. The fungus assay method applied to whole meals for the determination of thiamine gave higher values than the thiochrome technic. This suggested a comparatively large discrepancy due to meat in the meals, since the two methods gave similar results in application to the analysis of vegetables in the study noted above.

Vitamin content of variety meats, J. M. McIntire, B. S. Schweigert, E. J. Herbst, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 28 (1944), No. 1, pp. 35–40*).—Variety meats obtained from local markets were analyzed for thiamine by the method of Hennessey as modified by McIntire et al. (E. S. R., 90, p. 565); for nicotinic acid by the modified method described by Krehl et al. (E. S. R., 90, p. 727), after extraction with 4 percent NaOH; and for riboflavin by the fluorometric method as modified by Andrews (E. S. R., 90, p. 10), and also by the microbiological procedure with modifications in extraction and digestion as described by McIntire et al. (see p. 306). Riboflavin values by the two methods were found to be in good agreement.

Of the variety meats studied, Canadian bacon, summer sausage, a sandwich meat, and pork link sausage were richest in thiamine, containing in this group from 0.40 to 0.57 mg. per 100 gm. Of the fresh organ meats studied, heart was the richest in thiamine, containing 0.40–0.70 mg. per 100 gm.; the liver samples contained 0.19–0.23 mg., and the tongue 0.16 mg., these being similar to the muscle meats. Corned beef was the poorest source of thiamine. Liver sausage, with 1.30 mg. riboflavin per 100 gm., was the richest of the prepared meats in this vitamin. The other samples tested contained but 0.10–0.39 mg. per 100 gm., this being within the range for muscle meats. Corned beef was the lowest in riboflavin. Of the organ meats, liver was the best source of riboflavin, with 2.43–3.32 mg. per 100 gm.; hearts were also rich in this vitamin, containing 0.74–1.10 mg. per 100 gm. The sample of baby beef tongue contained 0.28 mg. riboflavin per 100 gm. Nicotinic acid was about the same in the prepared meats and muscle meats, with a range in values of 0.8–4.5 mg. per 100 gm. Liver, with 13.5–16.9 mg. per 100 gm., was richer than any of the organ meats in nicotinic acid. Heart was lower, but was also rich, containing 4.5–7.0 mg. per 100 gm.

Some of the meats were cooked by standard procedures of broiling, braising, or boiling. Greater amounts of the vitamins were retained in the meats after broiling than after braising. In the case of boiling the vitamin retention was dependent on the cooking time. In nearly every case, however, more than 90 percent of the nicotinic acid and riboflavin were recovered in the meat and drippings. Thiamine retentions were variable, with as little as 31 and 33 percent retained in braised baby beef heart and boiled tongue, respectively.

[Nutrition investigations at the Idaho station] (*Idaho Sta. Bul. 255 (1944), pp. 41–42*).—Analyses showed that new potatoes were at least twice as rich in ascorbic acid as mature tubers, and that the most important factor in determining the antiscorbutic value of baked potatoes was the promptness with which they were eaten after baking. Baked potatoes allowed to stand at room temperature lost 33 percent of their ascorbic acid in ½ hr., about 50 percent in 2 hr., and 100 percent in 4 hr. Lamb chops containing 1.0 µg. of thiamine per gram of fresh tissue and only 0.68 µg. per gram of broiled chops were shown to be a very poor source of thiamine when compared with pork chops (loin) which contained 8.35 µg. of thiamine per gram in the raw chops and 5.34 µg. per gram after broiling. Thiamine values of the broiled chops were at least one-third lower than those for the raw chops. Lamb heart, liver, and kidney were found to contain 4.2, 3.0, and 2.7 µg. of thiamine per gram of fresh tissue, respectively. Mature Alaska peas analyzed raw and after soaking and cooking (cooking water included in samples) showed a loss of about 13 percent of the thiamine and 18 percent of the riboflavin originally present in the raw peas. Feeding tests with these Alaskan peas indicated that they were excellent sources of the essential amino acids with the single exception of methionine.

[Food and nutrition investigations at the Louisiana station] (*Louisiana Sta. Rpt. 1943, pp. 10–13*).—In a study of the ascorbic acid content of okra, the 16 varieties analyzed were found to vary from 18 to 35 mg. of ascorbic acid per 100 grams, with short-pod varieties tending to contain the larger amount. Varietal differences were overshadowed by maturity differences, however, since ascorbic acid values decreased consistently with increasing size of pod. In the Green Velvet variety, pods 5–5½ in. long contained 40 percent less ascorbic acid than those 3–3½ in. long. Pods held at refrigerator temperature for 24 hr. retained 82 percent of their original ascorbic acid content, while those held 48 hr. retained 70 percent.

Cooking losses of ascorbic acid varied from 18 to 55 percent, depending on the method of cooking.

Tomatoes from June and October crops were tested at different stages of maturity for their content of ascorbic acid, thiamine, and riboflavin. The results showed that ripening in extremely hot sun, whether on the vine or after picking, had an adverse effect on ascorbic acid content. In the fall, field-ripened tomatoes were richer in ascorbic acid than the green ones, but in June, when the sun was very hot, tomatoes ripened in the field contained less ascorbic acid than the green ones and no more than those that were picked slightly pink. In the fall, tomatoes picked when slightly pink and ripened at room temperature were a little lower in ascorbic acid than field-ripened ones of the same variety, but in the hot summer the ascorbic acid values of the room-ripened tomatoes were 10 percent higher than the field-ripened samples. In the summer, all picked tomatoes ripened in the sun had lower ascorbic acid values than the freshly picked samples. In the spring, thiamine and riboflavin content did not vary with the degree of maturity but in the fall samples the thiamine content was considerably less and riboflavin slightly less in the green tomatoes than in the ripe ones. Pink-ripe and green tomatoes of the spring crop showed about a 20 percent loss of thiamine when ripened in the laboratory; in the fall, the pink-ripe samples similarly ripened showed a slight decrease and the green tomatoes a slight increase in thiamine.

Some observations of dark adaptation in man and their bearing on the problem of human requirement for vitamin A, E. L. Batchelder and J. C. Ebbs. (R. I. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 4, pp. 295–302, illus. 1*).—In this extension of earlier work (E. S. R., 89, p. 770), the question of minimal needs for vitamin A was approached by attempts to maintain the visual thresholds somewhat above those shown by the subjects before depletion of vitamin A. Using the same dark-adaptation instrument and the same procedures as before, four young adults, three women and one man, were given a diet deficient in vitamin A but adequate in all other respects, and their dark adaptation was measured three times weekly during the depletion and practically daily during the feeding of the vitamin A supplement.

At the beginning, all four subjects showed a sensitivity well within the normal range established in the previous study, but the rate of change in sensitivity was quite varied. None showed an immediate rise in threshold on the vitamin A-free diet. One showed a slight rise during the first weeks, but after the eighty-fifth day there was a gradual improvement in dark adaptation up to the one hundred and eightieth day when the study was discontinued without testing the effect of vitamin A supplementation. The other three showed a rise in threshold after 65 to 100 days. When this amounted to about 0.5 log unit, one subject was fed 2,000 International Units of vitamin A daily for 27 days, during which the threshold continued to rise. Increasing the dosage to 4,000 I. U., equivalent to 84 I. U. per kilogram body weight, led to the maintenance of a constant 30-min. threshold for about 45 days at a level from 0.7 to 0.8 log unit above her threshold at the beginning of the experiment. In another subject who did not receive vitamin A until her threshold level was 1.0 log unit above the original threshold, it required 5,000 I. U. daily, equivalent to 81 I. U. per kilogram body weight, to establish equilibrium, with the threshold close to the original dark-adaptation level. In the male subject, the threshold was 1.5 log units above the normal level when vitamin A was first administered. In this case, 5,000 I. U., equivalent to 74 I. U. per kilogram body weight, were required to establish constant dark-adaptation ability, but this represented a level almost 2.0 log units above the subject's normal dark-adaptation level.

Determination and content of carotene and vitamin A in Wisconsin butter, S. B. Berl and W. H. Peterson. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 5, pp. 527–538, illus. 1*).—The solvent-extraction method described for the determination of carotene and vitamin A in butters involved the use of an ether solution of the nonsaponifiable fraction of the butter. This solution was dried over anhydrous sodium sulfate and extracted with Skellysolve B (S. S. B.) Total pigment was determined in one aliquot of the S. S. B. extract, while from another aliquot noncarotene pigments were removed by extraction with 94 percent diacetone alcohol which previous tests had shown to be superior to 92 percent methanol for this extraction. This purified aliquot, after one washing with water and dilution to volume with S. S. B., was used for direct photocolorimetric determinations of carotene, essentially by the method of Koehn and Sherman (E. S. R., 83 p. 729). In a third aliquot of the original S. S. B. extract vitamin A was determined, after removal of the solvent under vacuum and solution of the residue in chloroform, by the antimony trichloride reaction with measurement of the blue color developed in an Evelyn photoelectric colorimeter, essentially by the method of Koehn and Sherman.

Carotene and vitamin A determinations in a series of Wisconsin butters showed the March butters to average about 9,500 International Units per pound, the July and September butters about 18,000, and the January butters about 10,500 I. U. per pound. Carotene constituted about 75 percent of the total natural butter pigment in summer butters and about 60–65 percent in winter butters. Storage of butters as long as 8 mo. did not result in a loss of carotene or of vitamin A.

The B vitamins in honey, G. KITZES, H. A. SCHUETTE, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 3, pp. 241–250*).—The various B vitamins were determined with special attention to methods in 40 honeys described in general as to place of origin and floral source. Thiamine was determined by a modification of the Hennessy-Cerecedo thiochrome method, with fluorescence measurements in a photofluorometer. Nicotinic acid, pantothenic acid, and riboflavin were determined by microbiological methods applied to the diluted autoclaved honey, the sample for the pantothenic acid determination having been neutralized before autoclaving. For these determinations, water extraction gave the same results as acid or alkali extractions and was more satisfactory since the latter procedure tended to produce excessive caramelization of the sugars. The growth response of yeast strains, as measured by turbidity readings, was utilized in the determinations of pyridoxine and biotin; enzyme digestion was used to release any bound pyridoxine. Folic acid was determined by the use of the streptococcus organism.

Honeys of the years 1940–42 contained per 100 gm. 7–60 µg. riboflavin, 20–360 µg. pantothenic acid, 72–590 µg. nicotinic acid, 2.2–12 µg. thiamine, and 4–27 µg. pyridoxine. Honeys of the year 1935–39 which had been stored in a dark closet at room temperature contained similar amounts of these vitamins, with the exception of pantothenic acid which, in the naturally acid honey (pH 4–5) had decreased, apparently by slow destruction, to the levels of 9–60 µg. per 100 gm. Biotin and folic acid, determined in a few samples, were found in traces averaging 0.066 µg. and 3 µg. per 100 gm., respectively.

Two samples of pollen and one of royal jelly were found many times richer in vitamin content than honey itself. Royal jelly was particularly rich in pantothenic acid and biotin, with values of 320 and 4.1 µg. per gram, respectively. The fact that pollen was in general 100 times richer than honey in vitamin content suggested that much of the vitamin value of the latter might be due to the pollen present in each sample. This was borne out by the 40 percent reduction in riboflavin and 25 percent reduction in nicotinic acid resulting from filtration of diluted honey.

The effect of commercial clarification on the vitamin content of honey, M. H. HAYDAK, L. S. PALMER, M. C. TANQUARY, and A. E. VIVINO. (Minn. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 3, pp. 319–321*).—Samples of clarified and unclarified honey obtained from commercial packers were assayed for thiamine, riboflavin, pantothenic acid, nicotinic acid, and ascorbic acid contents. There was a general decrease in the vitamin concentrations of the clarified samples, ranging from 8 to 45 percent. The decline, due to commercial clarification, was generally to a lesser degree than that observed in an earlier study (E. S. R., 88, p. 550) in which clarification was done under laboratory conditions. Determination of the antihemorrhagic activities of the commercial samples showed that there was no perceptible reduction in this activity due to the clarification. This suggested that the antihemorrhagic activity was not due to pollen present in the honey but to substances dissolved in it.

Retention of the B-vitamins in rare and well-done beef, S. Cover, B. A. McLaren and P. B. Pearson. (Tex. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 5, pp. 363–375*).—Right and left two-rib roasts of beef were cut alike from paired wholesale ribs and used as pairs, one being analyzed raw and the other after cooking by a standardized method. The entire meat (lean and fat) of each roast was removed and ground to a homogeneous mince which after thorough mixing was sampled for determinations of moisture and fat (ether extract) and the B vitamins. The thiamine values reported were determined photofluorometrically, essentially by the method of Harris and Wang (E. S. R., 87, p. 762). Riboflavin, nicotinic acid, and pantothenic acid were determined by microbiological procedures, those of Snell and Strong (E. S. R., 82, p. 587), Snell and Wright (E. S. R., 87, p. 12), and Strong et al. (E. S. R., 86, p. 588), respectively, applied to papain-takadiastase extracts from which the fat had been removed with chloroform and the proteins by precipitation at pH 6.8–7.0. This method of preparing the extract was utilized by McLaren et al. (see p. 161) in the simplified fluorometric method developed for determining riboflavin in meats. Riboflavin in the roasts was also determined by this latter method.

The 18 raw roasts from carcasses of Commercial grade averaged 1.3 µg. thiamine per gram moist basis (range 0.8–1.7); 1.5 and 1.6 µg. riboflavin by the fluorometric and microbiological methods, respectively, (ranges 1.0–2.2 and 1.2–2.0); 49 µg. (39–60) nicotinic acid; and 4.9 µg. (3.8–5.7) pantothenic acid. Raw rib roasts within a carcass did not show significant differences for any of the four vitamins, but roasts from different animals showed highly significant differences for thiamine, riboflavin, and nicotinic acid, and significant differences for pantothenic acid. Thiamine and riboflavin values for the three raw rib roasts from a carcass of Choice grade were within the range of those from the Commercial carcasses (two grades below Choice), but the roasts from the Choice carcass were lower than those from the Commercial carcasses in nicotinic and pantothenic acid. Vitamin retentions were calculated from values for the cooked and raw roasts expressed on the dry fat-free basis. The rare and well-done roasts, respectively, retained 75 and 69 percent of the thiamine, 83 and 77 percent of the riboflavin, 75 and 79 percent of the nicotinic acid, and 91 and 75 percent of the panthothenic acid. Retentions of thiamine and pantothenic acid were significantly lower in the well-done than in the rare roasts, but with riboflavin and nicotinic acid the differences between rare and well-done roasts were not significant. Only small amounts of the vitamins were recovered in the drippings, which in these tests were so meager in quantity that they formed crusts as the meat juices dripped into the pan. One serving (4 oz.) of rib roast of beef was calculated to furnish approximately 7 percent of the thiamine, 6 percent of the riboflavin, and 37 percent of the nicotinic acid recommended for a moderately active woman for 1 day.

The retention of vitamins in veal and lamb during cooking, J. M. McIntire, B. S. Schweigert, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 6, pp. 621–630*).—The three series of veal and two of lamb used in this investigation were of known origin and were cut to give paired samples from the two sides of the animal for analysis in the raw and cooked state. The cooking of the various cuts by roasting, broiling, braising, or stewing was conducted under standard procedures without seasoning. The preparation and storage of the meat samples, drippings, and stewing water, and the analysis for moisture and fat were carried on by methods previously used (E. S. R., 90, p. 565). Thiamine was determined by the method of Hennessy as modified by McIntire et al.; nicotinic acid by the method of Snell and Wright (E. S. R., 87, p. 12), after extraction with 4 percent alkali; and riboflavin by the method of Snell and Strong (E. S. R., 82, p. 587), with modifications in the digestion procedure involving autoclaving of the meat samples for 15 min. with O.1 N H_2SO_4, followed by overnight incubation with papain with subsequent neutralization and ether extraction.

The retention in the meat alone after roasting and broiling averaged 57 and 70 percent for thiamine, 82 for riboflavin, and 80 percent for nicotinic acid. The retention after braising of veal averaged 40 percent for thiamine, 73 for riboflavin, and 61 percent for nicotinic acid, and after stewing averaged 26, 66 and 52 percent respectively. The average total thiamine retention in the meat plus drippings was 62 percent after roasting and braising, 80 after broiling, and only 51 percent after stewing. The average total retention after the various cooking methods ranged from 87 to 101 percent for riboflavin and 92 to 100 percent for nicotinic acid. The vitamin content of different cuts of meats from the same carcass showed interesting variations. The average thiamine value was 1.7 μg. per gram of fresh lamb and 1.74 μg. for veal; the average riboflavin value 2.8 μg. for lamb and 3.15 μg. for veal; and the average nicotinic acid value for lamb 58 μg. and for veal 67 μg. per gram.

The influence of the thiamine intake of the pig on the thiamine content of pork, with observations on the riboflavin content of pork, R. C. Miller, J. W. Pence, R. A. Dutcher, P. T. Ziegler, and M. A. McCarty. (Pa. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 3, pp. 261–274*).—Three lots of pigs averaging about 47 lb. at the beginning of the experiment were fed rations containing, respectively, 5,761, 3,447, and 1,315 μg. thiamine per pound of feed. The average feed consumption was about the same for the three lots of pigs (5.1–5.3 lb. per day), so that the average daily thiamine intakes were approximately 29, 17, and 7 mg., respectively. These amounts were fully adequate, being greatly in excess of the suggested requirements of 1 to 3 mg. per 100 lb. of body weight. The growth response of the three lots of pigs was similar in spite of the difference in thiamine intake. Beginning on the one-hundredth day of the feeding experiment and usually at weekly intervals thereafter up to 140 days, one pig from each lot was sacrificed. The carcasses were chilled and samples were taken from the shoulder, the middle of the loin, the ham end of the loin, and the liver for determination of thiamine by the thiochrome method of Hennessy and riboflavin by the fluorometric method of Conner and Straub (E. S. R., 87, p. 10). Thiamine values on the fresh basis for the shoulder, center loin, and ham end of loin averaged 7.9, 9.5 and 10.3 μg. per gram, respectively, in pigs receiving 1,315 μg. thiamine per pound of feed. These values increased by approximately 100 percent to 15.1, 20.0, and 20.1 μg. per gram, respectively, with increase of the feed level to 3,447 μg. per pound, and again by 15 to 20 percent to 17.3, 23.1, and 23.9 μg. per gram, respectively, with an increase of the thiamine in the feed to 5,761 μg. per pound. These values show that different pork cuts may vary in thiamine content, the loin, for example, containing more than the shoulder; both of these muscle tissues contained more than the liver, which averaged but 3.3, 4.5, and 5.3 μg. thiamine per gram on the rations containing thiamine at the low, medium, and high levels, respectively.

Limited observations on two pigs indicated that pork muscle tissues nearly reached the saturation point, so far as thiamine storage was concerned, when the thiamine content of the ration approximated 5,800 µg. per pound. It appeared also that the thiamine accumulated rapidly in the pork muscle. Riboflavin values, determined incidentally in this study, averaged about 42 µg. per gram of fresh liver but amounted to only 2–4 µg. per gram for the muscle tissues. These values were obtained on riboflavin levels of 1,669–2,468 µg. per pound of feed.

Biotin, pantothenic acid, and riboflavin balances of young women on a milk diet, J. GARDNER, A. L. NEAL, W. H. PETERSON, and H. T. PARSONS. (Univ. Wis.). (*Jour. Amer. Dietet. Assoc., 19 (1943), No. 10, pp. 683–684*).—Three healthy young women were maintained for 10 days on a diet consisting of 3 qt. daily of pasteurized grade A milk purchased on the open market, supplemented only with 50 mg. daily of ascorbic acid, 5 cc. of a mineral mixture of 8.5 gm. iron pyrophosphate, 0.4 gm. copper sulfate, and 0.4 gm. manganese sulfate in a pint of water, and caramel candy ad libitum to supplement the calorie intake. The excreta of the first 3 days were discarded, and for the remaining 7 days combined fecal collections for days 4 through 6 and 7 through 10 and composite aliquots for the same periods of 24–hr. urines collected with suitable preservatives were analyzed microbiologically for biotin, pantothenic acid, and riboflavin, as was also done with representative samples of the milk.

The average daily intakes of the three vitamins were biotin 115 µg., pantothenic acid 6.9 mg., and riboflavin 7.0 mg. Minimum, maximum, and average values for urinary excretions were biotin 40.0, 57.7, and 49.5 µg., pantothenic acid 4.8, 6.7, and 6.0 mg.; and riboflavin 3.1, 3.6, and 3.4 mg., respectively. The fecal output of biotin ranged from 30.6 to 99.6 µg. with an average of 73.4 µg., and the total output (urine and feces) averaged 107 percent of the intake, indicating slight synthesis. The fecal pantothenic acid and riboflavin values were low, averaging only about 6 and 11 percent, respectively, of the intake. The total output of pantothenic acid almost equaled the intake, but of riboflavin amounted to only about 55 percent of the intake, thus indicating considerable destruction of the latter in the body.

The effect of high temperature and B-vitamin levels of the diet upon the metabolism and body composition of rats, H. P. SARETT and W. A. PERLZWEIG (*Jour. Nutr., 26 (1943), No. 6, pp. 611–620*).—In this extension of metabolism studies (E. S. R., 90, p. 135), groups of 5 rats each (30 days old and weighing 60–91 gm. at the beginning of the experiment) were maintained for 22–25 days at temperatures of 75° and 91° F. and on high and low intakes of vitamins of the B group and furnished different amounts of a concentrated liver extract, there being one group each on high vitamin at 91°, high vitamin at 75°, low vitamin at 91°, and low vitamin at 75°.

"At both levels of vitamin intake the rats at 91° gained more weight, retained more nitrogen, fat, and water than the corresponding controls. The concentration of water was lower and that of fat was higher in the animals at 91°. The concentration of riboflavin, pantothenic acid, and thiamine was highest in the bodies of the group on the high vitamin intake kept at 91° and was lowest in the low vitamin group kept at 91°. In the two groups at 75°, the level of intake had no effect upon the concentration of riboflavin and pantothenic acid in the tissues, while the thiamine concentration varied with the intake. The nicotinic acid of the tissues remained uninfluenced either by level of intake or temperature."

Some results of feeding rats a human diet low in thiamine and riboflavin, G. M. HIGGINS, R. D. WILLIAMS, H. L. MASON, and A. J. GATZ (*Jour. Nutr., 26 (1943), No. 4, pp. 347–359, illus. 5*).—For this study, which followed the same general pattern as a previously noted one in which the diets used were low in thiamine (E. S. R., 90, p. 714), certain changes were made in the diets to reduce the level of riboflavin below the average of 2.5 µg. These changes consisted chiefly in omitting entirely skim milk powder, cheese, and skim milk; allowing large portions of bread, beef roast, and butter, and adding cream. The quantities of thiamine and riboflavin furnished by the various diets were, respectively, diet E 0.96 and 2.00 μg. per gram of dry diet, F 1.62 and 2.00, G 1.82 and 2.90, H 1.78 and 2.90, and J 1.94 and 2.60 μg. per gram of dry diet. Observations of the effect of the altered diets on human subjects have been noted (E. S. R., 91, p. 101).

The growth curves of the rats on diets F, G, and H (breads made from enriched flour) showed only moderate increases over the basal diet, but on diet J (bread made from whole-wheat flour) the increase in growth rate was very marked. The utilization of the food was also much higher on diet J. When the food intakes were calculated per unit of surface weight, the animals on diet J were taking less food than those on diet H and yet their body weights were considerably greater. Hypochromic anemia developed in the animals on diet E. Diet F with its higher thiamine content improved erythrocyte and hemoglobin levels somewhat, but not significantly, while diet G with its higher content of both riboflavin and thiamine improved the levels of both significantly, essentially normal values being obtained on these diets as well as diet J.

Changes from the normal were observed in the liver, thyroid, and pituitary on all of the diets except J, and even on this diet there was some abnormality in the thyroid. Chemical analyses for thiamine and riboflavin of the livers, skeletal muscles, kidneys, and testes of animals on diet E showed very low concentrations of these vitamins.

Influence of increasing doses of thiamine and riboflavin on efficiency of their utilization, B. SURE and Z. W. FORD, JR. (Ark. Expt. Sta.). (*Jour. Nutr., 26 (1943), No. 6, pp. 659–671*).—With the use of the technic described elsewhere (E. S. R., 89, p. 504) and the precaution of collecting the feces for riboflavin analysis under petroleum ether to reduce bacterial synthesis of the vitamin, a quantitative metabolic study was made of the influence of increasing daily doses of thiamine and riboflavin on their efficiency of utilization by the rat. Animals 36 days old and weighing from 80–100 gm. were used. In each group of four, two received the same amounts of thiamine and riboflavin, one received no thiamine, and one no riboflavin. The first three groups were given doses of 5, 100, and 1,000 μg., and the experiment was continued for 26 days. For the other three groups the doses were 10, 20, and 50 μg. and the experiment lasted only 13 days.

For thiamine, the efficiencies of utilization at the 50, 100, and 1,000 μg. levels were 92.1, 82.9, and 51.9 percent, respectively. Because of the difficulty in completely preventing bacterial synthesis of riboflavin in the feces, the efficiency of utilization of this vitamin at the three lower levels could not be evaluated, but at the 50, 100, and 1,000 μg. levels, where the total in the feces was insignificant in terms of total intake, the figures obtained are thought to be reliable. These averaged 92.9, 87.3, and 88.3 percent, respectively, these values being considerably higher than for thiamine at the same dosages.

The total intake of the vitamin could not be accounted for by excretion or by storage in the animal tissues. Incubation at 37° C. of tissues of the liver, lung, heart, stomach, and small and large intestines showed an appreciable destruction of both thiamine and riboflavin, suggesting that part of the losses of these vitamins in metabolism are caused by their destruction in the tissues.

The effects of maturity, nitrogen fertilization, storage, and cooking on the ascorbic acid content of two varieties of turnip greens, R. REDER, M. SPEIRS, H. L. COCHRAN, M. E. HOLLINGER, L. R. FARISH, M. GIEGER, L. MCWHIRTER, O. A. SHEETS, J. F. EHEART, R. C. MOORE, and R. L. CAROLUS (*Georgia, Louisiana, Mississippi, Oklahoma, Virginia, and Virginia Truck Stas., South. Coop. Ser. Bul. 1 (1943), pp. 30+*).—This publication (No. 3) presents a complete and detailed report of a cooperative study referred to earlier (E. S. R., 89, p. 775). Turnip greens of the Shogoin and Seven Top varieties were grown from seed furnished by the U. S. D. A. Vegetable Breeding Laboratory at Charleston, S. C., at different locations, by similar cultural methods and under known environmental conditions. The factorial design experiments were conducted at Experiment, Ga., Baton Rouge, La., State College, Miss., Stillwater, Okla., and Blacksburg and Norfolk, Va. The two varieties of greens showed significant differences in ascorbic acid content, the Shogoin variety averaging 129.56 mg. per 100 gm. on the wet basis (12.98 mg. per gram dry basis), and the Seven Top 146.31 mg. per 100 gm. wet basis (11.52 mg. per gram dry basis). The differences in rank of the two varieties on the wet and dry bases was related to a statistically significant difference in moisture content, the Shogoin variety containing more moisture than the Seven Top. Nitrogen fertilization did not significantly affect the ascorbic acid content of the greens. Greens of both varieties contained more ascorbic acid when harvested at a late rather than an early stage of maturity. On the dry basis this trend was not apparent, due to the progressive and significant decrease in moisture content as the plants matured.

Storage for 24 hr. at 40° F. did not significantly affect the ascorbic acid content of the greens, but at room temperature storage losses of this vitamin amounted to 20.7 and 31.5 percent (dry basis) for the Shogoin and Seven Top varieties, respectively. Cooking losses in fresh and stored greens of the two varieties averaged about 25.7 percent with half an hour of cooking, but increased to 67.2 percent in 4 hr. of cooking; the cooking losses were greater for stored greens, whether held at room or refrigerator temperatures, than for those freshly harvested. Greens held at room temperature for 24 hr. and subsequently cooked for 4 hr. lost 82.8 percent of their ascorbic acid, while under the more favorable conditions of holding at 40° and cooking for only half an hour there was a loss of only 28.2 percent.

"There was a highly significant positive correlation between rainfall and ascorbic acid content of the greens on both the wet and dry bases. The effects of location and season were less clearly established. In this and in a preceding experiment in which the influence of location was considered [E. S. R., 89, p. 506], turnip greens of the highest ascorbic acid content were produced at Norfolk. Greens having the next highest ascorbic acid content were produced at Blacksburg, Experiment, and Baton Rouge, and greens of the lowest content were produced at State College and Stillwater. The spring crops at Experiment and State College had a higher ascorbic acid content (dry basis) than the fall crops. The reverse was true at Stillwater."

Vitamin C loss from soybeans stored in cooked and fresh state, M. E. REID (*Jour. Home Econ., 35 (1943), No. 9, pp. 587–588*).—Immature Jogun soybeans shelled and analyzed soon after harvest averaged 34 mg. ascorbic acid per 100 gm. Cooking of the shelled beans caused no loss of ascorbic acid nor did storage of the raw beans in the hydrator of the refrigerator for 19 and 72 hr.; refrigerator storage of the raw shelled beans for 96 hr. resulted in only a 6 percent loss of ascorbic acid. When the beans were similarly stored after cooking, however, the ascorbic acid losses amounted to 26, 41, and 44 percent with storage periods of 19, 72, and 96 hr. These results, checked in three separate tests, indicate that the loss of ascorbic acid from immature shelled soybeans is greater when they are stored after cooking rather than in the raw state.

Ascorbic acid content of 39 varieties of snap beans, P. H. HEINZE, M. S. KANAPAUX, B. L. WADE, P. C. GRIMBALL, and R. L. FOSTER. (U. S. D. A.). (*Food Res. 9 (1944), No. 1, pp. 19–26*).—A rapid method developed for routine analysis of ascorbic acid in snap beans was a modification of the method of Morell (E. S. R., 87, p. 15) and involved extraction of 25–40 gm. of beans, or 10–15 gm. of bean leaves, with 200 cc. of 1 percent metaphosphoric acid for 2 min. in a Waring blender. After discarding the first portion of the filtrate a 1-cc. aliquot was placed directly, without buffering, in the colorimeter test tube containing 10 cc. of a solution of 2,6-dichlorophenolindophenol (concentration 17 mg. per liter) and read in an Evelyn photoelectric colorimeter within 30 sec. Chemical blanks and their center settings were obtained by using 1 cc. of 1 percent metaphosphoric acid in 10 cc. of the dye solution. Center settings for the samples were obtained by using 1 cc. of the sample filtrate and decolorizing the remaining dye with a few crystals of ascorbic acid. The ascorbic acid content of the samples was calculated by using an equation derived by the method of least squares from readings on aliquots of pure ascorbic acid solution of various concentrations.

The vitamin C content of 39 varieties of snap beans was determined in two pickings of each in the spring and also in the fall harvest. The varieties tended to remain in the same relative order in regard to vitamin C content in the two harvest periods, with Mammoth Horticultural and Alabama 3 the two highest ranking varieties among the pole beans, and Unrivalled Wax, Lows Champion, Giant Stringless, and Masterpiece the highest among the bush varieties. In the spring the average ascorbic acid content ranged from 23–33.2 mg. per 100 gm. of fresh weight for pods of the bush beans and from 21.6–38.2 mg. for the pole beans; corresponding averages in the fall were 16.2–33.1 mg. and 17.9–31.2 mg., respectively.

"Little or no correlation between vitamin C content of the leaves and pods has been found when they were harvested at the same time or within 2 weeks of each other. A slight significant positive correlation between the vitamin C content of the leaves at the flowering stage of the plant and the pods was noted in over 50 percent of the pickings."

A study of normal human requirements for ascorbic acid and certain of its metabolic relationships, H. J. PURINTON and C. SCHUCK. (Purdue Univ.). (*Jour. Nutr., 26 (1943), No. 5, pp. 509–518*).—The ascorbic acid requirements of a group of 63 individuals, 52 women aged 16–49 yr. and 11 men aged 20–25 yr., were determined by the following procedure: The subject to be tested was given a definite diet with an ascorbic acid content of 15 mg. daily for the males and 14 mg. for the females and his normal activities continued. A 24-hr. urine sample was collected, and a fingertip sample of blood was taken before breakfast on the day of administration of a test dose which consisted of 500 mg. of ascorbic acid administered preferably intravenously. The same diet was taken for another 24 hr., during which frequent blood samples were taken and the 24-hr. urine again analyzed. By subtracting the quantity of ascorbic acid excreted in the test period from the quantity administered both in food and as the test dose, a so-called retention figure was obtained. By subtracting the excretion of ascorbic acid under fasting conditions from this retention figure, a value was obtained which is considered to be the quantity metabolized and probably required.

The average values obtained were for 8 women 16–20 yr. of age 112.5 mg. daily, 29 women 20–25 yr. 105.6, 11 men 20–25 yr. 124.7, and 15 women 25–49 yr. 80.9 mg. Hemoglobin studies on 19 of the subjects (not reported individually) showed a definite correlation in 17 with the ascorbic acid content of the plasma, those with ascorbic acid levels of at least 0.8 mg. per 100 cc. having hemoglobin levels above normal (15.6 gm. Haden) and vice versa. Low hemoglobin levels were more common in women than in men. Of 16 subjects with low basal metabolic rates, 68.8 percent had ascorbic acid requirements below the average. Lower retention of ascorbic acid tended to run parallel with higher excretions of citric acid as noted previously in animal studies (E. S. R., 90, p. 857).

It is concluded that an optimal intake for the young adult appears to be in excess of 100 mg. daily, while for adults between 25 and 50 yr. of age less than 100 mg. is required. It is noted, however, that since slightly more than half of the subjects had fasting plasma ascorbic acid levels of less than 0.8 mg. per 100 cc. of plasma, the high requirement figures may indicate to some extent the need for ascorbic acid for tissue saturation.

An intradermal test for vitamin C subnutrition. L. B. SLOBODY (*Jour. Lab. and Clin. Med., 29 (1944), No. 5, pp. 464–472, illus. 2*).—The test described differs from the one first suggested by Rotter (E. S. R., 78, p. 571) in that larger wheals (about 4 mm. instead of 2 mm.) are raised and a somewhat stronger concentration of dichlorophenolindophenol (N/300 instead of N/400) is used. The technic followed is essentially the same as used in the Mantoux and Schick tests. An ordinary tuberculin syringe and a short No. 26 needle are used; about 0.05 cc. of the solution is injected into the skin on a part of the forearm without hair or veins, and the exact times of injection and of disappearance of the blue color are noted with a stop watch.

Among 285 hospital patients of various ages, 102 had skin test times of from 3.5 to 9 min., 104 from 9 to 13, and 79 from 14 to 25.6 min. The blood levels of ascorbic acid ranged from zero to 1.97 mg. per 100 cc. Of 59 patients with blood levels below 0.3 mg. per 100 cc., the skin test times were more than 14 min. in 54. In 10 children on vitamin C-deficient diets, the skin test times increased as blood levels fell. It usually took about 9 weeks before the skin test time was over 14 min. When 2 of the children were given ascorbic acid, the skin tests returned to normal. Of 45 subjects who were given 200 mg. of ascorbic acid intravenously immediately after skin and bood tests, 44 showed a reduction of skin test times and an increase in blood levels.

In the opinion of the author, blood levels of ascorbic acid reflect only recent dietary intakes while the skin test parallels the degree of body saturation. "A skin test time of more than 14 min. suggests a definite degree of body unsaturation, from 9 to 13 min. mild saturation, and less than 9 min. a normal amount of vitamin C in the body tissues."

Effect of vitamin-C deficiency on experimental wounds: Tensile strength and histology, G. H. BOURNE (*Lancet [London], 1944, I, No. 22, pp. 688–691, 692, illus. 10*).—The tensile strengths of wounds in guinea pigs on various doses of ascorbic acid from 0 to 30 mg. daily were compared with the histological appearance of the wounds and in some animals with the amount of total ascorbic acid in the blood. The experiment lasted for 2 weeks, including 1 week before the wounds were made by standard technics and 1 week following the incision. The general histological appearance of the wounds did not vary consistently with the tensile strength, although there were more reticular fibers in the wounds with low than with high tensile strength. Total blood ascorbic acid showed some relationship to wound tensile strength. When the blood ascorbic acid was less than 0.1 mg. per 100 cc., the wounds were likely to have lower tensile strength. In discussing these findings and other reports in the literature, including the observations of Crandon, Lund, and Dill (E. S. R., 86, p. 871), the author states: "It is apparent from the concentration of vitamin C in healing tissue that the more extensive the injury the more vitamin C will be required. It seems also, since the tissue in greatest need of vitamin C appears to deplete other organs to obtain its requirements, that even if a wound heals fairly well other parts of the body may become deficient in the vitamin, and this suggests that the routine administration of vitamin C to all injured persons would be desirable."

The prophylactic requirement of the rat for alpha tocopherol, H. M. EVANS and G. A. EMERSON. (Univ. Calif.). (*Jour Nutr., 26 (1943), No. 6, pp. 555–568, illus. 6*).—The investigation here reported was undertaken to determine the minimal requirements for α-tocopherol of male and female rats from weaning until shortly before the approach of senescence, a period of about 16 mo. The animals were maintained from weaning on a vitamin E-low diet supplemented with α-tocopherol acetate at levels of 0.10, 0.25, and 0.75 mg. six times weekly. The study included growth, condition of the striated musculature, reproductive performance, and the prophylactic requirement of suckling young for tocopherol as measured by the presence or absence of muscular dystrophy.

For normality of the striated musculature and for growth of both sexes, the retirement was less than 0.10 mg. daily. This level was inadequate for the preservation of fertility in the males beyond the fifth month. The 0.25-mg. level was adequate for normal reproduction during approximately the first 9 mo., but inadequate thereafter. On 0.75 mg. daily, normal testes and fertility were maintained during the entire experimental period. In the females, the lowest level tested, 0.10 mg. daily, was sufficient for the birth of normal young even in the third gestation, which was completed between the eleventh and twelfth months. By the eighteenth month, evidence of deficiency was evident from orange-brown pigmentation of the uterus on levels of 0.10 and 0.25 mg. daily, but was absent in the group receiving 0.75 mg. The young born from mothers receiving 0.10 mg. showed muscular dystrophy with high mortality rate in the third week. Those born from mothers receiving 0.25 mg. daily showed a lower incidence of dystrophy and lowered mortality rate until the third breeding; then all of the young were paralyzed and died. All of the young from mothers receiving 0.75 mg. daily were normal in the first two breedings but showed slight incidence of dystrophy with complete recovery by the thirtieth day of life.

The nutritional requirements in inanition.—I, Observations on the ability of single foodstuffs to prolong survival. II, The effect of mineral and vitamin supplements on the survival of animals on single foods, L. E. Holt, Jr., and C. N. Kajdi (*Bul. Johns Hopkins Hosp., 74 (1944), No. 2, pp. 121–141, illus. 5; 142–151, illus. 2*).—The studies reported in these two papers were carried out on male rats which were placed on experimental diets at the age of 30–35 days and weight of 63–68 gm. The animals, from 15 to 25 in each group, were kept in individual cages designed to prevent coprophagy and given the food in question and water ad libitum. Records were kept of the quantities eaten and of the daily weights of the animals.

In the first study, glucose, olive oil, and vitamin-free casein were selected as the carbohydrate, fat, and protein foods, respectively. The rats fed glucose or olive oil alone showed a gradual loss of appetite beginning at the same time (toward the end of the first week) and progressing at the same rate. Greater difficulty was shown in the ability of the rat to adapt itself to high protein intake, but when this was successfully accomplished the survival period was longer than on the fat or carbohydrate diets. Marked differences in survival times were noted with the different sugars, best results being obtained with glucose, levulose, maltose, sucrose, and invert sugar. Differences were also noted in survival times on different fats. The water consumption was highest on protein, next on carbohydrate, and lowest on fat. With the different carbohydrates, water consumption was highest with lactose and galactose, particularly the latter. These findings are thought to have practical importance in conditions of water scarcity.

In the second study, olive oil was used for some of the tests and glucose for others as the basis for supplementation, while in some tests both fat and carbohydrate were used. The food, vitamin supplement, and water were offered in separate containers, thus giving the animals free choice. Sodium chloride and a complete mineral mixture had no effect on the survival of rats on the glucose diet. The addition of thiamine in 0.01-percent solution prolonged survival on the glucose diet from an average of 27.3 days to 49.8 days. The other B vitamins were without effect except for a slight prolongation of survival time with niacin. On a mixture of 90 percent olive oil and 10 percent halibut-liver oil and one of 90 percent olive oil and 10 percent wheat-germ oil survival was no longer than on olive oil alone, but there was a slight increase in the survival time when the animals were also offered the dilute thiamine solution. On a combination of glucose and olive oil, the survival period was somewhat longer than on glucose alone. When thiamine was also supplied, this effect was no longer observed.

The experiments are thought to indicate a thiamine deficiency relatively early in inanition, while the stores of minerals, fat soluble vitamins. and other B factors are not similarly depleted. There was evidence of still earlier depletion of some unknown factor concerned in the utilization of both carbohydrate and fat.

The detection and treatment of nutritional deficiency diseases among industrial workers.—A progress report, T. D. Spies (*Jour. Amer. Med. Assoc., 125* (*1944*), *No. 4, pp. 245–252, illus. 6*).—In this paper, read before the Sixth Annual Congress on Industrial Health, Chicago, Ill., February 16, 1944, the author describes his methods of diagnosing and treating nutritional deficiencies and the application of the system to industrial workers and their families. Attention is called to the meticulous clinical study needed before a diagnosis of nutritional deficiency diseases is justified, and three case reports are given in illustration. One of these shows how accurate diagnosis and specific therapy relieved dietary deficiency disease in the wife and child of a skilled mechanic, enabling him to return to work; another how the detection of absorption difficulties in a pellagrous steel mill worker led to continued therapy by injections, making it possible for the man to keep at work although always bordering on relapse; and the third case illustrates the gradual development of multiple deficiency in a man who had eaten a poor diet all his life. The health of this patient was restored with proper therapy and was maintained on a better diet.

Response of rats maintained on diets fumigated with methyl bromide, H. C. Spencer, V. K. Rowe, E. M. Adams, and D. D. Irish (*Food Res., 9* (*1944*), *No. 1 pp. 11–18, illus. 2*).—"Rats maintained for 1 yr. on diets fumigated with 2 and 6 lb. of methyl bromide per 1,000 cu. ft. and having an average bromide content of 26.2 and 63.7 mg. per 100 gm., respectively, made normal weight gains. These rats showed no evidence of intoxication or nutritional deficiency as determined by hematological, histopathological, analytical, and organ-weight studies. Similar results were obtained with rats fed a diet containing 0.1 percent sodium bromide. It is concluded that foodstuffs fumigated with the usual commercial concentrations of 1 to 2 lb. of methyl bromide per 1,000 cu. ft. and properly aerated will contain no residues which might have a deleterious effect, even when such fumigated foods are included as a large part of the human dietary."

TEXTILES AND CLOTHING

Home laundry investigations, P. B. Potter (*Virginia Sta. Bul. 361* (*1944*), *pp. 31, illus. 9*).—The laundry tests were carried out by placing in the washing machine squares of Indian Head muslin treated, by a process outlined, with a standard soil solution made up of lampblack, mineral oil, and carbon tetrachloride. After being washed and ironed, the shade of gray to which the samples had been reduced in washing was determined by means of a simple photometer in a dark room. By this procedure, which is described in detail, it was possible to evaluate one at a time the influence of various factors in washing. The results of extensive tests over a period of time showed that as important as the washing machine itself were the washing conditions. Essential factors for good results included a goodly supply of hot water, preferably soft water, proper use of a good soap, correct time period for washing, limited loading of the machine, and adequate rinsing. Of the temperatures tested (from 100° to 170° F., by 10° intervals), 160° gave the best cleaning results, but 140° was nearly as good, and it was more economical to maintain in the water-heating equipment. It is pointed out that home water-heating equipment may not always provide sufficient water at this temperature for the whole washing and that housewives may prefer some lower temperature, probably 110° to 120°, which can be endured in contact with the hands. Results indicated that it is possible to wash clothes too long, since the suds break down after 20 to 25 min. and allow the dirt to go back into the fabric. Fifteen min., and in some cases less time, is suggested as a satisfactory period. Washing too many clothes at a time thwarted the movement of clothes through the water. Better progress was made by slightly underloading the machine. Washing machines of different types and makes showed some differences in their ability to wash, and considerable differences were noticed in durability and ease of operation. A particularly desirable type was the underwater gyrator type.

The soaps tested were kinds in general use for home laundering. They showed a wide range of prices which resulted in costs of 1½ to 3 cents per machineful of clothes (with softened water); the laundry cake soaps were the cheapest and the granulated soaps in packages the most expensive. When used for softening water, the cheaper cake soaps were more effective than purer soaps, but any soap proved an expensive means of softening the water (1¼ to 3 cents per machineful). Sal soda and other special water softeners cut the cost of water softening to a negligible figure.

Rinsing was a very important part of the washing process and was best effected by passing the clothes through two or three different waters at a temperature nearly as high as that of the original water—particularly for the first rinse. Wringing of the clothes each time they passed from one water to the next had an appreciable cleaning effect. After laundering cotton sheets 100 times, or over a 2-yr. period, it was found that the fabrics' strength declined by about 40 percent. This deterioration appeared to be due to the general wear and tear of laundering and not to any fault in the process. Three commercial laundries showed very similar results, which gave a somewhat lower decline in fabric strength than was shown by sheets laundered under home conditions.

REPORTS AND PROCEEDINGS

Wartime agricultural research: Fifty-first Annual Report of the Idaho Agricultural Experiment Station for the year ending June 30, 1944, C. W. Hungerford et al. (*Idaho Sta. Bul. 255 (1944), pp. 63*).—In addition to articles noted elsewhere in this issue on economics, nutrition, and engineering, brief progress reports are given on beef cattle, sheep and swine, and animal diseases, including methods of feeding bonemeal to steers, phosphorus diets for milking ewes and fattening lambs, blood phosphorus level of range ewes, breeding hogs, control of swine brucellosis, abortion in range ewes, mastitis treatments, and use of lentin in atonic indigestion of cattle; dairy production and manufacturing, including studies of the riboflavin content of milk and a process for dehydrating Cheddar cheese; poultry, including meat meal and soybean meal as protein supplements, simplified war emergency rations, methionine in peas, variations in efficiency of animal protein concentrates, and laying flock mortality; crops, crop breeding, and soils, including nitrogen fertilization of grasses, precropping of alfalfa in bindweed control, gypsum for peas and alfalfa, legumes and grasses for eroded hilltops, and wheat varieties as regards winter survival and stem rust resistance; fruit and vegetable crops, including seed production of onions and carrots, oil sprays to eliminate hand weeding of carrots, and new apple varieties; agricultural engineering, including methods of harvesting hay, irrigation of potatoes, and current consumption of frozen-storage locker plants; bacteriology, including factors affecting growth of alfalfa, and standard tube v. a new experimental whole blood antigen for pullorum disease; agricultural chemistry, including dehydration of baked potatoes, soil management practices, and phosphate fertilizer for alfalfa; plant diseases, including virus diseases of fruits and potatoes, bean diseases, pea breeding for resistance to near-wilt, aster yellows disease of truck crops, root rot of peas, and control of bacterial ring rot of potatoes; insects, including substitute insecticides for pea weevil control, partial control of onion thrips, and wireworm injury to beans; and branch station studies on lamb and steer feeding, preparation of beet top silage, phosphorus fertilization, sweetclover as a soil fertility builder, varieties of oats, barley, and corn, grass culture and seed production, potato culture and breeding, cause of jelly end rot, and storage losses, dwarf smut as a factor in winter wheat production, and stubble-mulch in erosion control.

Progress through agricultural research: Annual Report [of the Louisiana Station, 1943], W. G. TAGGART ET AL. (Partly coop. U. S. D. A.). (*Louisiana Sta. Rpt. 1943, pp. 142, illus. 29*).—In addition to studies noted elsewhere in this issue, this report presents data on nutrition research, including the vitamin B complex content of rice and its milled products, the thiamine content of biscuits, and the vitamin A and carotene content of milk; agricultural economics, including cost studies of milk production, large and family-size sugarcane farms, sorghum for industrial alcohol, farm prices, price ratios, farm wages, milk transportation, soybeans for oil, and use of free range for cattle; agricultural engineering, including erosion studies of lower Mississippi loessial soils, flame cultivation for sugarcane weed control, sweetpotato dehydration and harvesting machinery, and rice harvesting, drying, and storage; animal industry, including protein supplements and other feeds for fattening swine, renovation of beef cattle pastures, swine breeding, and finishing calves for market; crops and soils, including cotton breeding and culture, cover crops and green manures, flax and hemp for southern Louisiana, effect of hormones on field crops, Dallis grass seed production, loss of nitrogen from soils in the rice area, pasture improvement, pasture-rice rotations, and fertilizers for rice and sugarcane; dairy research, including pasture, Alyceclover, and lespedeza studies, hay production, dehydrated sweet potatoes, grain rations, mineral deficiencies of Louisiana herds, new cheese varieties, artificial insemination of dairy cows, and effect of iodinated casein on milk cows; entomology, including cryolite dusts for the sugarcane borer, red rot disease and borer damage, pine compounds for peach pests, alfalfa insects, sweetpotato weevil control, and boll weevil and cotton aphid control; horticultural research, including breeding of sweetpotatoes, cabbage, collards, potatoes, Creole onions, tomatoes, strawberries, peas, and tung trees; plant pathology, including red rot and mosaic of sugarcane, diseases of shallots, limb blight of figs, soybean diseases, root rot of rice and disease resistant varieties, seed treatment of rice and peanuts, blight of arborvitae, sprays v. dusts for strawberry leaf blights, sprays for control of downy mildew of cucumbers, ring rot of potato, and bacterial blight of beans; poultry research, including lowcost homes, simplified feeding methods and rations, farm egg coolers, dried muskrat meal for poultry, and effect of sulfur on growth and parasite control; sugarcane, including varieties and soil management; veterinary science, including vaccination of adult cattle against brucellosis with Strain 19 vaccine and immunity developed against the large stomach worm (*Haemonchus contortus*); and work at the substations, including fertilizer and variety tests with strawberries and cucumbers, okra breeding, variety tests with cotton, corn, tomatoes, sweetpotatoes, soybeans, and oats, breeding of edible cowpeas, corn, watermelon, and rice; fertilizer tests with oats, sweetpotatoes, peaches, cotton, and rice; pasture mixtures; control of cabbage caterpillars, and nicotine as a substitute for rotenone in controlling the turnip aphid; apiculture; and cotton diseases and culture.

Annual Report [of Puerto Rico University Station] 1943, J. A. B. NOLLA (*Puerto Rico Univ. Sta. Rpt. 1942, pp. 59+*).—This report embodies progress results of the year's work on anemia of imported cattle; efficient utilization of feed by swine at low temperatures; protein needs of dairy cattle; roasted soybeans as a poultry feed; digestibility of royal palm seed; costs of producing hogs on garbage and other feeds; Para grass for grazing steers; soybeans and alfalfa as forage crops; pineapple chlorosis; variety tests of melons and oranges; coffee and cotton fertilizers and culture; fertilizers, culture, and breeding of sugarcane; control of the sugarcane moth borer; seed storage; fertilizers for sweetpotatoes, plantains, and yautias; breeding of beans, corn, cucumbers, onions, peppers, and sweetpotatoes; tomato mosaic control; combating mole crickets and rats; meat and fish marketing; preservation of pinguinain with merthiolate; length of day and production of beans, soybeans, and tomatoes; resin and rubber extraction from various Puerto Rican plants; pot tests to determine available nutrients in soils; analyses of vegetable oils; and yeast production for animal feeding.

What's new in farm science: Annual report of the director, [Wisconsin Station], II, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 463 (1943), pp. 80+, illus. 33*).—This portion of the annual report (E. S. R., 91, p. 236) deals with studies of wheat and corn varieties and breeding, corn borer damage in Wisconsin, legumes as nitrogen sources for pasture, pasture renovation and fertilization, bromegrass-alfalfa mixtures, alfalfa fertilizers, Ladino clover, foliage diseases of pasture grasses, moisture content of hay for baling, fertilizer on heavy soils for soybeans, soil erosion, silage crops and processes and use in steer feeding, cow manure for hogs and poultry, irradiated yeast for pigs in winter, wartime chick rations, vitamins for poultry, feathering rate in poultry, hardiness in raspberries, cross-pollination of apples, codling moth sprays, apple maggot and scab control, bordeaux mixture for leaf spot of cherries, European brown rot of cherries, varieties and breeding of soybeans, eggplant, beans, and peas, fertilizers and chemical sprays for tomatoes and sweet corn, borax for blackspot and weed control in beets, carrot and aster yellows, sabadilla dust for squash bugs, dusts for control of pea aphid and potato diseases, potato stalk borer and other potato insects, potato fertilizers, potato ring rot, leaf roll, and yellow dwarf control, Hypoxylon canker disease of poplars, "burn blight" of pines, reforestation, chemical weed killers, weed control in growing Russian-dandelion, hemp fertilization, sabadilla for vermin-proofing paper cartons, and armyworm control.

MISCELLANEOUS

Thomas Jefferson and the scientific trends of his time, C. A. BROWNE (*Chron. Bot., 8 (1944), No. 3, pp. 362–423, illus. 16*).—The aim has been to describe some of the relations of Jefferson to the scientific movements of his period, including many of direct bearing on agriculture.

Agricultural experimentation in wartime (*Farm and Home Sci.* [*Utah Sta.*], *5 (1944), No. 3, pp. 10–13*).—A brief statement of some of the results of recent investigations of the station.

Mississippi Farm Research, [September 1944] (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 9, pp. 8*).—In addition to articles noted elsewhere in this issue and meteorological notes for August 1944, this number contains the following: Mortality Rate of Dairy Calves Low in College Herd, by W. C. Cowsert (p. 1); Fumigation, Crib Lining To Protect Corn From Weevils, by A. L. Hamner (p. 1), based on Circular 110 (E. S. R., 90, p. 506); Livestock Production in Mississippi, by D. W. Parvin (pp. 1, 2); The Production and Utilization of Vetch, by J. L. Anthony (pp. 3-6), also to be issued as a station bulletin; and Cotton One of the Five Major Items Still Under Parity (p. 7), and Low Grade of Cotton Ginned in August Means Lower Prices Received by Grower (p. 8), both by D. G. Miley.

NOTES

Purdue University and Station.—A course for persons interested in the operation of country elevators and the farm supply business is being offered to run from January 2 to February 23. The instruction includes the chemistry of feeds, feed requirements of poultry and livestock, sanitation and prevention of disease, grain grading, seed testing, elementary accounting, and laws relating to the elevator business.

Kansas Station.—A compilation in *Kansas Industrialist* of recent gifts, mainly by commercial interests, shows an aggregate of $103,870 divided among 22 projects. Among the larger research undertakings provided for are $20,500 for work on the dehydration of Kansas foods; $19,990, chemical and physical properties of starch; $3,927, nutritive value of wheat plants; $6,000, milking machines; $12,500, improvement of cream for butter making; $6,000, processing and storage of dried egg products; $7,870, use of soya flour in baked products; $3,063, direct chlorination of starch; $6,000, improving quality of poultry products; and $5,000, wheat quality and milling.

Louisiana University.—Maj. Gen. Campbell B. Hodges, president from his retirement from the United States Army in 1941 until April 1944, died in New Orleans November 23, 1944, in his sixty-fourth year. A native of Louisiana and a graduate of West Point in 1903, he had held many important military assignments, including those of commandant at West Point and military aide to President Herbert Hoover.

Minnesota University and Station.—Dr. Maurice C. Tanquary, professor of apiculture and apiculturist since 1928, died on October 25, 1944, in his sixty-third year. A native of Illinois, he had received from the University of Illinois the A. B., A. M., and Ph. D. degrees. He had also served as assistant entomologist in Illinois, 1907–12; as instructor, assistant professor, and professor of entomology in the Kansas College, 1912–13 and 1916–19; as assistant State entomologist in Texas, 1920-24; and as zoologist of the Crocker Arctic Expedition, 1913-16; and was engaged in commercial beekeeping from 1924 to 1928.

Nebraska University and Station.—Dr. Leland H. Stott, associate professor of family life; H. E. Alder, assistant professor of poultry husbandry; and G. W. Trimberger, instructor in dairy husbandry, have resigned. Recent appointments include Dr. Katherine M. Maurer as associate professor of home economics (family life), Dr. Rufus M. Moore as assistant professor of horticulture, Doretta Schlaphoff as instructor in home economics, foods, and nutrition, and Verne Jeffers as assistant in dairy husbandry.

New York State Station.—Dr. John F. Davis, associate professor of agronomy and associate agronomist in the Delaware University and Station, has been appointed assistant professor of vegetable crops and will work on plant-deficiency symptoms, soil deficiencies, and fertilizer requirements of canning crops.

Cornell University and Station.—The death during November 1944 is noted of three widely known staff members. These were, on November 1, George N. Lauman, 70, professor emeritus of rural economy, and Dr. J. A. Bizzell, 68, professor emeritus of agronomy, and, on November 30, Dr. Herbert H. Whetzel, 67, said to have organized the first department of plant pathology in this country.

Professor Lauman was a Cornell graduate in 1897 and remained with the institution until his retirement in 1942. He had served as assistant and instructor in horticulture from 1897 to 1903 and subsequently as instructor, assistant professor, and professor of rural economics, becoming the first to hold the chair of rural economy at Cornell. He had also given much attention to the history of agriculture.

Dr. Bizzell was a native of North Carolina, received from the North Carolina College the B. S. degree in 1895 and the M. E. degree in 1900, and served there as instructor in chemistry and assistant chemist from 1895 to 1901. Coming to Cornell as a fellow, he received the Ph. D. degree in 1903, and had served as assistant chemist in the station, 1903–8, assistant professor of soil technology, 1908–12, and professor from 1912 to his retirement on July 1, 1944. He had made many contributions to the literature of soil technology and fertility.

Dr. Whetzel was a native of Indiana, graduated from Wabash College in 1902, and came to Cornell the same year as assistant in botany. Named professor and head of the department in 1907, he served as its administrator until 1922 and subsequently as professor of plant pathology. He had been active in teaching, extension, and research, inaugurating a system of university teaching and a series of industrial plant pathology fellowships. Among other books, he was the author of Outlines of the History of Phytopathology, and since 1932 had been manager of the Phytopathological Classics. He was given the honorary D. Sc. degree by the University of Puerto Rico in 1926 and by Wabash College in 1931.

North Carolina College.—A farm and industry conference with a registered attendance of 93 farmers, 115 businessmen, and 39 from the faculty of the College of Agriculture was held at the college October 5 and 6, 1944. A series of about 100 local follow-up meetings in 1945 is contemplated.

Pennsylvania College and Station.—Capt. T. B. Keith, on leave from the department of animal husbandry, has been commended for exceptionally meritorious service in connection with the collection and movement for the armed forces of indigenous food reserves of the Paris region. Conrad B. Link has returned from the Army and resumed his duties as assistant professor of horticulture. Dr. H. Arthur Meyer, assistant professor of forestry, has returned from an assignment with the Foreign Economic Administration on cinchona procurement in Venezuela. Dr. Arthur J. G. Maw, acting head of the poultry husbandry subsection of the Iowa College, has been appointed professor of poultry husbandry. Dr. Donald E. H. Frear, professor of agricultural and biological chemistry, has been appointed civilian consultant on the chemistry of insecticides and fungicides by the Committee on Medical Sciences of the Office of Scientific Research and Development.

South Dakota College and Station.—Thomas M. Olson, associated with the department of dairy husbandry since 1920 and head of the department since 1924, died October 25, 1944, aged 60 years. A native of Wisconsin, he was graduated from the University of Wisconsin in 1915 and received the M. S. degree from the Iowa College in 1920. He had also been a teacher and superintendent of schools from 1906 to 1912 and a county agent in Minnesota from 1915 to 1919.

Texas College.—Horatio L. Van Volkenberg, head of the department of parasitology since 1937, died October 13, 1944, at the age of 51 years. He had received the D. V. M., B. S., and M. S. degrees from Cornell University, and his service had included periods at the New York State Veterinary College, 1918–21, the U. S. D. A. Biological Survey, 1922–23, and the Bureau of Fisheries, 1924–25, and as parasitologist from 1926 to 1937 at the Puerto Rico Federal Station.

Utah College and Station.—Dr. W. W. Henderson, since 1926 head of the department of zoology and entomology, died October 31, 1944, at the age of 65 years. A native of Utah and a graduate of Brigham Young University in 1903, he received the M. S. degree from Cornell University in 1905 and the Ph. D. degree from the University of California in 1924. He had also served as professor of zoology in Brigham Young University from 1905 to 1910 and as its president from 1920 to 1926, as president of Weber College from 1910 to 1914, and as professor of zoology and entomologist in the Utah College from 1917 to 1920.

Charles T. Hirst, associate professor and associate agronomist, has retired after 34 years' service. The resignations are noted of Dr. A. L. Stark, associate and extension horticulturist, to become director of agricultural research and information for a chemical company; and Dr. D. E. Madsen, head of the department of veterinary science, to go into private practice in California. Maj. Reuben L. Hill, chief of the nutrition service for the Fifth Service Command for the past three years, has returned as head of the chemistry department; and L. S. Morris, after two years in the Army, has returned as head of the department of landscape architecture.

Vermont University and Station.—A farm of 144 acres, adjacent to the present university farm, has been purchased. Most of the soil on this farm is a fairly light, sandy loam, in contrast to the rather heavy clay soil of the present university farm. Part of it will be used to conduct experiments with field crops, vegetables, and small fruits and to run crop trials to determine the strains and varieties best adapted to Vermont conditions. A portion may also be used in connection with an expanded program in poultry research and instruction.

John A. Hitchcock, head of the department of agricultural economics, died November 8, 1944, aged 50 years. He was a graduate of the university in 1918 and received its M. S. degree in 1924. He had been extension dairy specialist, conducted research in farm management in cooperation with the U. S. D. A. Bureau of Agricultural Economics, and since 1924 had carried on research in agricultural economics for the station.

U. S. Department of Agriculture.—Dr. Harry V. Harlan, prominently identified with the barley investigations of the Department since 1909, died in Arizona on November 6, 1944, aged 62 years. A native of Illinois, he received the B. S., and M. S. degrees from the Kansas College in 1904 and 1909 and the D. Sc. degree from the University of Minnesota in 1914. He had also served as instructor in agriculture in the Philippine Islands from 1905 to 1908.

Lyster H. Dewey, associated with the Department since 1890 and in charge of its investigations with fiber plants other than cotton, including the development of improved strains of fiber flax and hemp from 1899 until his retirement in 1935, died in Kenmore, N. Y., on November 27, 1944, at the age of 79 years. A native of Michigan, he was graduated from the Michigan College in 1888 and served there until 1890. Following his retirement, he had continued specialized work with fiber in connection with the manufacture of automobile tires.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

An automatic gas recording apparatus, H. MILLER, J. EDGAR, and A. G. O. WHITESIDE (*Cereal Chem., 20 (1943), No. 3, pp. 355–361, illus. 4*).—This apparatus, described in essential mechanical detail and illustrated in an undimensioned drawing (section), is a form of recording manometer making a series of manometer height recordings upon blueprint paper which show the rate of gas evolution in each of a series of time units.

The data taken from curves made by this machine have been successfully applied to test baking. On the basis of these data, routine sugar-requirement corrections have been made on flours baked by the modified American Association of Cereal Chemists malt-bromate-phosphate baking method for the past 2 yr.

Anti-spattering device for water suction pumps, L. G. KEIRSTEAD. (Maine Expt. Sta.). (*Chemist Analyst, 33 (1944), No. 3, p. 69, illus. 1*).—The author suppressed the spattering caused by such a pump in a shallow sink by putting a one-hole rubber stopper on the outlet tube of the pump and fitting over this stopper a large rubber tube (1 in. in diameter) long enough so that its end lay nearly level on the bottom of the sink. The evacuating efficiency of the pump was not impaired.

Boring holes in laboratory glassware, R. E. DUNBAR. (N. Dak. Agr. Col.). (*Chemist Analyst, 33 (1944), No. 3, pp. 70–71*).—The author uses two hard brass cork borers, of which the larger serves as a bearing for the smaller and is secured in a vertical position to a strong ring stand with a burette clamp or the like. The smaller cork borer is introduced into the larger, and both are so placed that the smaller rests securely upon the glass to be cut. A little lubricant between the two should be used. An ordinary laboratory stirring motor is attached to the upper end of the smaller borer by means of a one-hole rubber stopper. The cutting edge of the cork borer should be surrounded with a suspension of a suitable abrasive in water.

The rapid determination of total nitrogen in soil, E. M. EMMERT. (Ky. Expt. Sta.). (*Soil Sci., 58 (1944), No. 4, pp. 289–290*).—In a method for determining total nitrogen in soil by oxidation to nitrate, previously reported by the same author (E. S. R., 72, p. 155), it was found that amide nitrogen and ammonia nitrogen were not oxidized and total nitrogen was not determined in soil that contained nitrogen in these forms. To avoid this source of error in his former method, the author here proposes that amide nitrogen be hydrolyzed to ammonia and the ammonia nitrogen combined as glycine by means of monochloracetic acid, the amino acid group being readily oxidizable to nitric acid so as to be included in the phenoldisulfonic estimation of nitrate nitrogen.

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[1] **The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).**

Determination of iron: A study of the o-phenanthroline method, S. L. BANDEMER and P. J. SCHAIBLE. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 5, pp. 317–319, illus. 2*).—Sodium citrate was found more satisfactory than the acetate in adjusting the reaction for the development of the color of the iron-*o*-phenanthroline complex. When the pH was adjusted before the introduction of *o*-phenanthroline, the rate of color development was influenced by such factors as the time interval between the addition of reagents, temperature of the solutions, type and amount of phosphate present, amount of citrate, and length of time the solutions stood before being read in the photometer. When the sodium citrate was added after the hydroquinone and *o*-phenanthroline at temperatures above 20° C., these factors did not adversely affect the recovery of iron. Under these conditions, maximum color developed when the solutions stood only 30 min., and complete recovery of iron was secured. For samples of similar materials of approximately the same size, it was found expedient to use an average volume of citrate rather than to titrate each sample individually.

Report of the 1943–44 methods of analysis subcommittee on the determination of iron in cereal products, M. HOWE (*Cereal Chem., 21 (1944), No. 5, pp. 412–418, illus. 2*).—In continuation of the work of the 1942–43 subcommittee on methods of analysis of iron (E. S. R., 91, p. 502), the committee studied the preparation of cereal products by various methods, including hydrochloric acid treatment of the ash, sodium carbonate fusion of the ash, and wet ashing of the sample by the procedure of Jackson (E. S. R., 80, p. 153). The samples sent to the collaborators included (1) an unenriched flour, (2) the same flour enriched with 10 mg. of iron as ferrum reductum, (3) a bread made from the enriched flour, (4) a whole-wheat flour, and (5) a bread made from the whole-wheat flour.

The results obtained by the 15 collaborators are presented in detail and discussed. It was found that wet ashing did not consistently give higher results than dry ashing, that there was no particular advantage in the sodium carbonate fusion, and that individual laboratory methods (including the use of *o*-phenanthroline, potassium thiocyanate, and numerous variations of the α, α'-dipyridyl method) and did not give any closer agreement than the method suggested by the committee. The α, α'-dipyridyl method with dry ashing was as satisfactory as any method now available for the determination of iron in cereal products. It is considered that more practice and improvement in the technic should bring better agreement between laboratories.

Report of the 1943–44 methods of analysis subcommittee on riboflavin assay, J. S. ANDREWS (*Cereal Chem., 21 (1944), No. 5, pp. 398–407, illus. 3*).—This is a report of the second of a series of collaborative studies on riboflavin assay methods (E. S. R., 90, p. 10). The present study was directed at evaluating the permanganate and Florisil treatments when separately applied to the purification of cereal extracts. The procedures are given in detail. The results, discussed at length, indicated that neither of these treatments was of any value as applied to enriched flour. Direct reading of the flour extracts (from the collaborative sample), without any purification, gave a value of 2.78 µg. per gram, in excellent agreement with the calculated value, 2.76. When the extract was adsorbed on Florisil and eluted with pyridine-acetic acid solution, a somewhat higher value was obtained, indicating the inadequacies of the Florisil. Use of permanganate with extracts of enriched bread proved helpful in removing the interfering impurities, although the treatment was not entirely effective, since the average value obtained was 3.42 µg. per gram, as compared with the calculated value of 3.16. Treatment of the bread extract with Florisil had no effect on the final results.

"Values reported by the collaborators employing their regular procedures were in general quite satisfactory. Both fluorometric and microbiological methods were represented and, particularly in the instance of flour, yielded values which closely agreed with the calculated values. Fluorometric assays of enriched bread were somewhat higher than those obtained microbiologically and were in closer agreement with the value calculated from the bread ingredients."

Report of the 1943–44 methods of analysis subcommittee on thiamine assay, J. S. ANDREWS (*Cereal Chem., 21 (1944), No. 5, pp. 388–397, illus. 2*).—This is a report of a collaborative study of the efficiency of zeolite for removing interfering substances, and of factors relating to the conversion of thiamine to thiochrome, including the effect of the amount of ferricyanide, the order of adding ferricyanide and alkali, the period of shaking, and the stability of the extracted thiochrome. It is concluded that the use of zeolite presents no appreciable source of error and that the concentration of ferricyanide and the order of adding ferricyanide and alkali have some effect upon the assay. Where a considerable excess of ferricyanide was employed, it was found preferable to add the alkali first, followed immediately by the ferricyanide. One-half min. of shaking of the oxidation mixture resulted in maximum fluorescence in most cases, and additional shaking had no significant effect. Isobutanol extracts of thiochrome appeared to be sufficiently stable to present no problem in the fluorescence measurements. Assays of enriched flour gave an average value of 2.11 mg. per pound, in very close agreement with that calculated from the data on unenriched flour and the added amount of pure thiamine. The average value for the bread made from the enriched flour was 23 percent below the flour value, suggesting that baking losses approximated this percentage figure. The possibility that some assay errors can be attributed to faulty thiamine standards is discussed.

Quantitative determination of redwood bark fiber in wood-redwood fabrics, E. R. KASWELL (*Amer. Dyestuff Rptr., 33 (1944), No. 11, pp. 237–238*).—Redwood, 100-percent clean mohair, 100-percent low-grade wool, and 100-percent wool top (the three latter extracted with carbon tetrachloride) were found, respectively, to be 32, 99, 98.7, and 98.1 percent insoluble in sulfuric acid; the redwood was 78.8 percent insoluble in potassium hydroxide, while the mohair and wools were 0 percent insoluble. Using the weights of the fabric sample taken for analysis, the determined residue weights, and the residue factors for the pure fibers, simultaneous equations were set up to permit the calculation of the percentages of redwood and wool fibers in fabric blends.

The effect of variety and environment on the equilibrium moisture content of soybean seed, A. C. BECKEL and J. L. CARTTER. (U. S. D. A. and 12 expt. stas.). (*Cereal Chem., 20 (1943), No. 3, pp. 362–368, illus. 2*).—Approximate equilibrium moisture content of the seed of eight strains of soybeans grown at five locations in the North Central region was determined at eight relative humidity levels and 70° F. Significant variance due to variety and location was observed. Including all sample variance at each of the humidity levels, the standard deviation ranged from 0.163 at the low humidity level to 0.382 at 60 percent relative humidity.

From data at 18 percent relative humidity and 70°, it was shown to be possible to eliminate the routine moisture determination without affecting the accuracy of conversion of other analytical data to the dry basis.

Effects of moisture on the physical and other properties of wheat.—IV, Exposure of five varieties to light rains during harvest, C. O. SWANSON. (Kans. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 6, pp. 703–714*).—Continuing the series previously noted (E. S. R., 92, p. 164), the effects of exposure of five wheat varieties to several small rains during the harvest season of 1941 are recorded, together with those of wetting by soaking wheat in the straw.

Exposure to rains totaling less than 1 in. decreased the test weight enough to depress the grade from No. 1 to No. 3 and No. 4. The artificial wetting had similar effect. The interior of the endosperm changed from a predominantly vitreous to a predominantly mealy condition, particularly in the early Blackhull and Blackhull varieties. The lowering of the test weights and the increase in the mealy condition had no effect on the flour yield or on the baking value. Chiefkan was the least affected, while Kanred and Tenmarq were intermediate.

The effect of sprout damage on the quality of durum wheat, semolina, and macaroni, R. H. HARRIS, G. S. SMITH, and L. D. SIBBITT. (N. Dak. Expt. Sta. and U. S. D. A.). (*Cereal Chem., 20 (1943), No. 3, pp. 333–345, illus. 4*).—Aliquots of a sound, hard, amber durum wheat were sprouted to three distinct stages, delimited by the length of sprout obtained. Each stage was then blended in various proportions, by weight, with the original sound wheat to obtain mixes for experimental milling.

The degree of sprouting did not affect the ease of milling the blends. Macaroni doughs made from blends containing a high percentage of badly sprouted wheat were crumbly and "short," but after the customary kneading appeared to have normal consistency. Weight per bushel was consistently lowered by sprouting. Semolina yield was significantly reduced when over 20 percent of sprouted wheat was included in the blend. Little influence upon semolina ash was noted, except that high percentages of sprouted wheat showed a slight tendency toward reduction of the ash content. Diastatic activity was greatly increased both by the percentage of sprouted wheat in the blend and by the degree of sprouting, while absorption was generally lowered by the same factors. The effects of sprouting upon diastatic activity and macaroni color were the most marked. The determination of diastatic activity may be a convenient method for predicting the probable macaroni color of a sample suspected of containing sprout damage, provided no complicating factors such as blight or other damage are involved. Ten percent blends of the second and third stages had more effect upon both diastatic activity and color than 100 percent of stage 1. Five percent of heavy damage reduced the color score 40 percent. The second stage of sprouting decreased the score less severely. The wheat from the first stage had a noticeable effect at a concentration of 20 percent in the blend. The macaroni had a brownish coloration when made from blends high in severely sprouted wheat. It appeared from the data that length of sprout is more important in relation to quality than the percentage of sprouted kernels present.

Soaking and chilling without germination significantly reduced test weight and grade but did not affect macaroni color.

Factors influencing the pearling test for kernel hardness in wheat, M. E. MCCLUGGAGE. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem., 20 (1943), No. 6, pp. 686–700, illus. 2*).—The percentage of wheat pearled off was not materially affected by normal variations in temperature nor by the moisture content within the limits 7–15 percent. Sifting the pearled wheat over a 20-wire screen slightly increased the standard deviation in one case and decreased it in another, although general experience had indicated some improvement in accuracy by sifting. The size of the charge greatly affected the percentage pearled off, though not the relative differences between varieties. By substituting a blank for the regular screen, it was determined that most of the grinding is done by the screen. Both screen and stone should be replaced from time to time if consistent results are to be expected. By adjusting the time of pearling, it was found that essentially the same results could be secured with speeds of 1,725, 1,520, 1,300 r. p. m. In a collaboration study with three other laboratories, involving five varieties of wheat, it was found possible to obtain substantially the same results at all laboratories by adjusting the speed and time of pearling on the basis of the quantity of wheat pearled from a standard sample supplied for the purpose. In a study of six varieties of hard red winter wheat grown at five stations in the southern Great Plains in each of 3 yr., it was found that kernel hardness, as measured by the pearling test, is determined mostly by variety, but also to a considerable extent by the environmental factors of location and year of growth.

The following standard procedure is recommended: Pearl a 20-gm. charge of cleaned, unsized wheat for 1 min. at a speed of 1,725 r. p. m. and sift over a 20-wire screen, in accordance with details previously specified.

Measurement and significance of gluten quality, J. C. BAKER, M. D. MIZE and H. K. PARKER (*Cereal Chem., 20 (1943), No. 4, pp. 506–516, illus. 4*).—The authors describe an instrument in which a ball-point probe is forced down, slowly and with measurable force increase, upon the surface of a gluten ball so prepared and supported in a specially designed holder that the probe forces the test surface inward without penetrating until the surface can no longer resist the penetrating force and suddenly yields, permitting the probe to enter with an abrupt increase in the rate of its downward motion. One can read on the scale the force, in grams, at which this penetration of the surface occurs. The readings thus taken indicate the force in grams required to cause a 1-mm. ball to penetrate the surface of the prepared gluten. Penetration occurs only when the surface has reached its elastic limit and rupture of the surface takes place.

Commercial wheat germ, its composition, E. GREWE and J. A. LECLERC. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 4, pp. 423–434*).—The 19 samples of wheat germ examined included from 2 to 6 samples from each of the 5 classes of American-grown wheat. Analyses for mineral content were made for each class.

The germ from soft red winter wheat contained an average of 39.79 percent of undetermined carbohydrate, while the germ from hard spring wheat contained only 24.28 percent, the difference being largely due to admixed endosperm. The germ from white wheat showed greater variations in its composition than that from the other classes. The diastatic activity and sugar were higher and the protein and ash lower in the germ from white wheats than in that from the other wheats. Germ from hard red spring and durum wheats averaged appreciably higher in fat than did germ from winter wheats. The average weight per unit volume of flaked germ was considerably less than that of granular germ.

In general, the nitrogen content of the germ was found to be correlated with the class of wheat. Hard spring wheat germ was highest in nitrogen, the average being 5.82 percent; durum wheat germ contained 5.45 percent; hard red winter, 5.42; soft red winter, 4.54; and white wheat, 4.38 percent. The alcohol-soluble nitrogen of wheat germ makes up about one-seventh of the total nitrogen, whereas in flour fully half of the total nitrogen is alcohol-soluble. The salt-soluble nitrogen of wheat flour constitutes one-fourth of the total nitrogen, while that of the germ makes up over 60 percent of the total. The fraction regarded as albumin and globulin was found to be much higher in the germ than in the flour; it represented 51.2 percent of the total nitrogen in germ and 20.7 percent in flour. When the proportion of endosperm was high, the proportions of nitrogen soluble in 70-percent alcohol and the copper-hydroxide-precipitated nitrogen were usually high, whereas the proportions soluble in 3-percent sodium chloride and in 5-percent potassium sulfate solutions were low.

Wheat germ in bread making, E. GREWE and J. A. LECLERC. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 4, pp. 434–447, illus. 11*).—The extract of momentarily wetted germ, when separated and incorporated in bread dough, produced somewhat inferior loaves, but the extract of steeped germ produced a loaf as good as, or even better than, the control. The beneficial effect of steeping increased with increase in time up to 6 or 8 hr., and the addition of potassium bromate along with germ resulted in an improvement in bread-making properties. Steeped germ up to 10 percent could be added to flour dough without appreciable detrimental effects on the quality of the loaf. The addition of 2.5 or 5 percent of steeped germ may give even better bread than when no germ is used, and the use of 15–20 percent produced a very satisfactory bread. The addition of salt (in quantities normally used in bread making) to the germ during steeping improved the handling properties of the dough.

The colloidal properties of the germ, as measured by viscosity, were appreciably changed by the addition of salt solutions. The steeping of wheat germ resulted in an increase in its diastatic power but a decrease in oxidizable substances. These changes, quite rapid at first, continued through 7 hr. In order to produce the best bread, the germ should be steeped for about 3 hr. before being added to the dough or to the sponge.

Very satisfactory bread was produced when germ from white, soft red winter, hard red winter, and durum wheats was used. Germ from hard spring wheat was less satisfactory.

A further comparison of flours obtained with the micro and Allis-Chalmers mills, L. D. Sibbitt, G. M. Scott, and R. H. Harris. (N. Dak. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 6, pp. 679–685, illus. 2*).—The authors compared milling yields, flour ash, loaf volume, and crumb color obtained in two series of hard red spring wheat millings on the Allis-Chalmers and micro experimental mills. The work was done in a laboratory with temperature and humidity control.

In a series of 25 replicate millings of one wheat on each mill, the micro mill "gave higher yields of long-patent and total flour than [did] the Allis mill. Flour ash was higher in the micro-milled flours, and the moisture content lower." In a second series, 30 samples of different hard red spring wheat varieties were milled on the 2 mills. Less pressure on the micro reduction rolls than in the first series was used, with the result that flour yields and flour ash contents were in better agreement. No significant differences in flour yield between milling methods were found, "but micro flour ash, though reduced, was still higher than the Allis values." High positive correlations between the two mills were found for flour yields, flour ash, and loaf volumes. The authors agree with the general conclusion that a fairly reliable knowledge of milling and baking performance may be secured by micro milling and baking tests.

The pentosans of wheat flour, J. C. Baker, H. K. Parker, and M. D. Mize (*Cereal Chem., 20 (1943), No. 3, pp. 267–280, illus. 2*).—The authors describe a method of preparing the water-soluble pentosans of flour in high purity.

Flour contains approximately 1 percent of water-soluble pentosans which will form an irreversible gel upon reaction with certain oxidizing agents used as dough improvers. The properties of the purified pentosans in respect to viscosity, gelling reaction, and the effect of enzymes were shown to correspond to the same properties of flour extracts of high concentrations. Temperature change and addition of glutathione produced effects on purified pentosan solutions similar to their effects upon doughs. The gelling reaction and viscosities of soluble pentosans were found much altered by extracts of malt, wheat germ, and wheat bran, but little affected by many other dough ingredients. It is pointed out that these characteristics of soluble pentosans suggest that they play an important role in controlling dough properties.

The insoluble pentosans of flour were observed to be largely associated with starch and were found in quantities proportional to the surface of the starch. This suggested a coating of insoluble pentosan on starch which may account for many of its properties and its behavior toward enzymes.

The relation of proteolysis to the characteristics of oxidation and reduction in doughs, R. M. Sandstedt and K. Fortmann. (Nebr. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 5, pp. 517–528, illus. 8*).—The authors found that the action of the reducing agents naturally occurring in flour may be reversed by subsequent oxidation and consider that this observation shows that the reduced character of doughs and bread made from unoxidized flour is not due to proteolysis. They feel that it indicates, moreover, that even the relatively large quantity of proteinase reported to be present in clear flours (as compared to normal patents and straights) produces no perceptible irreversible degradation. The action of moderate quantities of added reducing agents is also shown to be reversible by subsequent oxidation. Degradation of the gluten proteins by papain (added in quantity to produce in the bread a reduced appearance similar to that produced by the added reducing agents) was not reversible by subsequent oxidation. Accordingly, though proteolysis and reduction produce characteristics in dough and bread that are visually indistinguishable, they are believed not to have identical modes of action on the gluten.

Direct determination of fermentation rates in dough, Q. Landis and C. N. Frey (*Cereal Chem., 20 (1943), No. 3, pp. 368–376, illus. 12*).—A form of differential manometer is described, the record consisting of the trace made by a bubble in the horizontal tube of the manometer upon photographic developing paper, drawn under the tube at a constant rate by a kymograph mechanism. Curves are reproduced, and typical results obtained with those of various types are discussed.

Selective fermentations of maltose and lactose in doughs as measured by the pressuremeter method, H. H. Browne. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 6, pp. 730–733*).—A method of determining the ratio of maltose to total fermentable sugars is described. This technic was used to demonstrate that by using bakers' yeast and *Torula cremoris* in equal quantities in a bread dough containing milk solids all sugars present can be made to contribute effectively to the leavening of the dough.

The correlation of mixograms with baking results, J. A. Johnson, C. O. Swanson, and E. G. Bayfield. (Kans. State Col.). (*Cereal Chem., 20 (1943), No. 5, pp. 625–644, illus. 5*).—The most important use of the recording dough mixer appears to be that of furnishing information that supplements baking data, such as mixing requirements, mixing tolerance, and varietal pattern. The varietal pattern tends to establish qualitative differences between flours that may or may not have different baking qualities. Flours of known inferior baking qualities may thus be readily distinguished and discarded as unsuitable for bread making.

The effect of different operators on the evaluation of mixograms, R. H. Harris. (N. Dak. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 6, pp. 739–744, illus. 1*).—Significant differences among 3 operators were found for dough development and curve height, but not for dough stability, 10 hard red spring wheat flours adjusted to a uniform protein level of 12.0 percent by dilution with wheat starch having been used. There were significant interactions between varieties and operators for dough development and stability, but not for curve height. The results obtained by different pairs of operators for dough development were highly correlated. The corresponding correlations were lower for dough stability, while no significant correlation was found in two of the comparisons between operators and curve height. Differences in curve properties among samples were very much greater than operator effects, except for curve height.

Chemical factors affecting the baking quality of dry milk solids.—III, The effect of several milk fractions on loaf volume, H. A. Harland, U. S. Ashworth, and N. S. Golding. (Wash. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 5, pp. 535–542*).—In continuation of previous work (E. S. R., 89, p. 23), the authors report upon experiments in which nondialyzable fractions of both poor-baking dry milk solids and fresh skim milk showed definite improvement in baking quality following heat treatment. The baking qualities of both acid and rennet wheys from fresh skim milk were improved by heat treatment. The addition of concentrated whey to a dough formula further reduced the loaf volume. This was again improved by heat treatment. There was some evidence that during dialysis the detrimental factor in whey either slowly dialyzed or was changed in some manner which reduced its effect. Casein prepared by the acid method was not changed in its influence on baking by heat treatment.

The differential stability of the malt amylases—separation of the α and β components, E. KNEEN, R. M. SANDSTEDT, and C. M. HOLLENBECK. (Nebr. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 4, pp. 399-423, illus. 5*).—The precipitation maxima of the wheat- and barley-malt β-amylases were found to lie in the ammonium sulfate concentration ranges of from 25 to 35 percent and in the alcohol concentration ranges from 56 to 68 percent. The wheat- and barley-malt α-amylases showed maximum precipitation in the ranges from 25 to 35 percent and from 15 to 25 percent of ammonium sulfate, respectively, and of from 50 to 56 percent and from 44 to 50 percent of alcohol, respectively. Because of overlapping solubilities, no clear-cut separation of the two amylase components could be effected by precipitation.

Differential inactivation at from 50° to 70° C., combined with H-ion concentrations between pH 4.0 and pH 7.0, demonstrated that the stability of either amylase was influenced by both. At a given temperature, the stability of β-amylase was dependent on the pH of the solution, and at a given pH value the stability of α-amylase was dependent on the temperature. However, temperature was the more significant factor with β-amylase, H-ion concentration with α-amylase.

The calcium-ion content of the solutions was of prime importance to the stability of the amylases. Calcium proved to be a stability factor for α-amylase and an instability factor for β-amylase. Conditions for maximum retention of α-amylase (90–100 percent) and complete inactivation of β-amylase were the presence of calcium, relatively high pH (6.0–7.0), and a temperature of 70°. Conversely, conditions for maximum retention of β-amylase with complete inactivation of α-amylase were found to be the absence of calcium, relatively low pH (3.0), and a temperature of 30°.

Dilution of the extracts decreased the stability of the amylases. This instability appeared to be dependent, however, not on the amylase concentration but on the concentration of accompanying substances in the extract. The amylases also differed markedly in heat stability, the barley-malt α-amylase being more stable to heat than wheat-malt α-amylase, but the β-amylase from wheat malt more stable than that from barley malt.

Practical methods for the preparation of α-amylase free from β and β-amylase free from α are given, together with a technic for using the purified β-amylases in the preparation of the substrate for the determination of α-dextrinogenic activity.

Studies with Bacillus polymyxa, I, II, H. KATZNELSON (*Canad. Jour. Res., 22 (1944), No. 5, Sect. C, pp. 235–250, illus. 1*).

I. *Some factors affecting the fermentation of wheat by Bacillus polymyxa* (pp. 235–240).—Factors influencing the fermentation of 15 percent wheat mashes by strains of *B. polymyxa* in the laboratory were studied in an attempt to obtain maximum yields of 2,3-butanediol, which is a compound convertible to butadiene—an essential precursor of synthetic rubber. Neither the nature of the inoculating medium nor the age of the inoculum affected the fermentation, but small amounts (0.5 percent) of inoculum lowered the yield. Increasing the surface of the fermentation mixture and addition of yeast extract each resulted in improved yields of the diol. Different strains varied markedly in fermentative ability; of 82 tested, 10 gave excellent results—over 3 percent diol. Combinations of 2 strains (phage-susceptible and phage-resistant) also gave satisfactory yields, but mixtures of 5 or 10 caused a sharp drop in diol production. Low-grade, low-quality wheat samples were as satisfactory as those of high-grade in diol yield. Elevator screenings also proved capable of being fermented by *B. polymyxa,* though low yields were obtained, owing undoubtedly to the low starch content. Since screenings command a low price on the market, however, it may be economically practical to consider their utilization for butanediol production.

II. *Bacteriophage of Bacillus polymyxa in relation to the 2,3-butanediol fermentation* (pp. 241–250).—The procedure described resulted in the isolation of a number of phages against various strains of *B. polymyxa;* of 82 strains tested, 63 were completely and 6 partially lysed. The phages produced plaques that were separated into 8 morphological groups. No special relationship between susceptibility to phage and yield of butanediol was noted. These phages were very sensitive to temperature, being inactivated by 30 min. at 55° C. They were transmitted through the bacterial spore, under which conditions they withstood 80° for 60 min. Of 50 strains tested, 8 were lysogenic. Phage proved capable of almost completely arresting the fermentation of wheat mashes by susceptible strains, but certain resistant cultures gave good yields in its presence. Mixing resistant and susceptible strains resulted in lower yield, but a good fermentation was obtained in the presence of phage by combining 3 resistant strains. Even in the absence of phage, a mixture of 5 strains was not favorable, probably because of antibiotic effects among the individual strains. Secondary cultures differed markedly in the nature of growth and spore-producing capacity from primary strains and were on the whole poorer diol producers. It is suggested that under ordinary conditions in the factory, proper sterilization of the equipment and materials, aseptic technic, and use of well-tested nonlysogenic strains should prove adequate precautions against this bacterial virus.

Selenium distribution in milled seleniferous wheats, A. L. MOXON, O. E. OLSON, E. I. WHITEHEAD, R. J. HILMOE, and S. N. WHITE. (S. Dak. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 3, pp. 376–380*).—Four samples of seleniferous wheat were milled in an experimental mill, and the distribution of selenium in the milled fractions has been determined. Nitrogen-selenium, sulfur-selenium, and nitrogen-sulfur ratios were also determined in one of the samples. There was much difference among the selenium concentrations in the various fractions. The bran had the highest selenium content in all cases and was likewise highest in nitrogen.

Bromine residues from methyl bromide fumigation of cereal products, H. D. YOUNG, R. H. CARTER, and S. B. SOLOWAY. (U. S. D. A.). (*Cereal Chem., 20 (1943), No. 5, pp. 572–578*).—Cereal product samples were taken after commercial fumigation in (1) the entire mill or warehouse; (2) in vacuum or atmospheric vaults; (3) under tarpaulins; and (4) in boxcars. The results indicate that commercial fumigation practices can be expected to increase the bromine content of flour and other cereal products to a degree ranging from practically nil to 247 p. p. m., or nearly 12 times the amount originally present. In most instances, however, the fumigated product contained less than twice the original concentration. Vacuum vault fumigation apparently left bromine residues larger than those from other practices.

Investigation of a death by asphyxiation in a grain elevator bin containing flaxseed, H. A. LILLEVIK and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 20 (1943), No. 3, pp. 318–328, illus. 1*).—Respiratory activity of 4,700 bu. of slightly heating, sample grade flaxseed containing about 9.0 percent moisture upon storage in an interstice, closed, grain-elevator bin filled to within 7 ft. of the top for 58 days resulted in the death of an elevator employee.

The air immediately above the flaxseed contained 1.8 percent oxygen and 11.1 percent carbon dioxide, while a sample drawn 6 ft. within the flaxseed contained 0.4 percent oxygen and 12.6 percent carbon dioxide. Interseed air composition was uniformly low in oxygen and high in carbon dioxide content to a depth of about 33 ft. in the grain. No free hydrogen cyanide was found, but traces of carbon monoxide (0.02–0.04 percent) were detected. Flaxseed from the top of the bin had a test weight of 32 lb. per bushel and contained 29 percent dockage. The sample contained 25.4 percent flaxseed showing sprout damage and gave only 35 percent germination. Respiratory activity of the uncleaned sample was 5 to 20 times greater and the fat acidity considerably higher than that of other flaxseed undergoing storage in the same elevator. Bacteria and saprophytic fungi were found in abundance and are believed to be responsible for the abnormally high respiratory activity of the seed.

Precautions for preventing the accidental asphyxiation of workmen entering grain tanks are outlined.

Studies on toxic substances of locoweeds, Astragalus earlei, and others, G. S. FRAPS and S. H. WENDER (*Texas Sta. Bul. 650 (1944), pp. 23, illus. 4*).—The material obtained by Fraps and Carlyle (E. S. R., 77, p. 101) from locoweed and named "locoine" was found not to be a single compound but to contain several closely related toxic substances. The compounds precipitated by silicotungstic acid are toxic but do not produce all the symptoms of locoism. The spectrum absorption curve of the purified compound so precipitated resembles closely the spectrum absorption curve produced from the compounds not precipitated. When the fraction not precipitated by the silicotungstic acid was treated with benzoyl chloride, both the benzoylated and nonbenzoylated products contained toxic compounds. Adsorption of the picrates on aluminum oxide separated two or more compounds. Silver nitrate precipitated a compound having the characteristic spectrum absorption curve of the loco compounds. Extraction with isoamyl alcohol and purification with flavianic acid removed impurities. Every active fraction showed the same general type of spectrum absorption curve, though there were differences in details. Evidence of chemical changes in the solutions of the separated toxic substance after storage, even at low temperature, was observed, and losses occurred in the process of separation. Some of the compounds found may have been formed during the process of separation.

The efficiency of the production of ethanol from starchy substrates, L. M. CHRISTENSEN. (Univ. Nebr.). (*Cereal Chem., 20 (1943), No. 4, pp. 478–482*).—Because of the multiplicity of units used, variations in moisture contents of raw materials, and other variable factors, statements of conversion efficiency are confusing and have, at best, only a comparative value. They are of little use in estimating absolute efficiency. By measuring yields of both alcohol and dry residual solids per 100 gm. of dry matter charged to the fermentation process, it is possible to establish a useful index of the fermentation efficiency. In addition to a statement of yields on the basis of dry matter charged to process, it may also be desirable to state the alcohol yield in terms of the dry weight of the principal raw material processed. This can be done by subtracting from the total alcohol produced in the fermenter the amount of alcohol expected from the inoculum, the saccharifying agent, and any other minor constituents, crediting the balance to the major constituent.

In the present orthodox process for the manufacture of ethyl alcohol from grains, there is a loss of carbohydrate, probably as CO_2 and water, amounting to about 17 percent of the total carbohydrate, as starch charged to process. The present process is thus only about 83 percent efficient as regards carbohydrate utilization, not 92 to 95 percent as commonly reported.

Starch from Easter lily bulbs, N. W. STUART and B. BRIMHALL. (Iowa Expt. Sta. and U. S. D. A.). (*Cereal Chem., 20 (1943), No. 6 pp. 734–739, illus. 2*).—The authors note that at the present time domestic production of bulbs of the Easter lily, *Lilium longiflorum* Thunb., is being successfully expanded. They find that high-quality starch is easily isolated from the bulbs. It resembles potato starch in granule size, gelatinization temperature, and X-ray pattern, but the properties of its pastes (appearance, consistency, and variation with temperature) are more nearly like those of cornstarch.

The production of sorgo sirup in Mississippi, I. E. Stokes, J. F. O'Kelly, and E. B. Ferris. (Coop. U. S. D. A.). (*Mississippi Sta. Cir. 122 (1944), pp. 7, illus. 4*).—Some of the more essential features of the pressing and evaporating processes are very briefly dealt with, and drawings of an evaporating furnace and of an evaporating pan with skimming troughs are included.

Vanilla curing and its chemistry, F. E. Arana (*Puerto Rico Sta. Bul. 42 (1944), pp. 17+, illus. 6*).—In general, all of the 14 combinations of vanilla-curing methods compared gave a satisfactory product. The Guadeloupe killing treatment, which involves scratching the beans with a pin, appeared to be superior in all criteria of evaluation except appearance and susceptibility to mold. The beans killed by freezing had practically no mold and a very suave aroma but ranked medium in other respects. The ethylene treatment acted more as a maturing than as a killing agent. Oven sweating was found to be superior to sun sweating as to time required for sweating and drying and mold development.

The intensity of reddish-brown color and the total solids, vanillin, and resin contents of the beans were found to increase consistently with the degree of maturity of the beans.

Weight loss, other than that due to loss of water, was negligible during curing. Moisture content approached a steady value during the first 3 mo. of conditioning. The optimum moisture content of cured beans was considered to be from 30 to 35 percent. A nomograph shows the weights to which 100-lb. lots of beans having initial moisture contents of from 70 to 82 percent should be reduced during curing to obtain a given moisture content (between 0 and 50 percent) in the end product.

The glucovanillin content, its distribution in the beans, and the distribution and action of the β-glucosidase which hydrolyzes the glucovanillin are discussed. A crude peroxidase preparation was obtained from green vanilla beans and was shown to oxidize vanillin in vitro. Qualitative tests for peroxide were positive not only with green beans but also with beans that had completed the sweating period and with others that had been completely cured. The inactivation of peroxidase by hydrogen sulfide, which might be expected to lead to a higher vanillin content because none would be oxidized by the enzyme, resulted, however, in a lower vanillin content and a retarded development of the brown color during curing. Qualitative evidence of the presence of an oxidase was obtained. Oxygen, nitrogen, and hydrogen peroxide had no demonstrable effect on the formation of vanillin. The rate of over-all oxidation in the beans after various killing treatments and during the curing process was determined by measuring the carbon dioxide given off.

AGRICULTURAL METEOROLOGY

On the application of the theory of probability to meteorological statistics, M. Wurtele. (Univ. Calif).). (*Amer. Met. Soc. Bul., 25 (1944), No. 8, pp. 338–340, illus. 3*).—The author endeavors to point out how the current method of presenting certain meteorological frequency statistics leads to confusion and even to error in the deductions made therefrom, while the application of an elementary theorem of probability theory to the data provides a method of presentation which is entirely satisfactory. The problem is illustrated by the fog-wind-rose, a diagram appearing frequently in the literature on the forecasting of fog. Instances relevant to the study of fog might be precipitation, cloud cover, frontal passage, and wind force. If the probabilities of fog, given various combinations of these factors, were calculated for a number of stations, it is believed that a considerable step would have been taken toward incorporating the wealth of existing data into a form useful to the forecaster.

On reporting plateau-region pressures in ratios: A suggestion, R. L. IVES (*Amer. Met. Soc. Bul., 25 (1944), No. 8, pp. 332–333*).—It is believed that if the station pressure, corrected for temperature by standard methods, is compared with the cumulated average of the pressures for the same day and hour in all the years that the station has been in operation, the majority of the local influences will be cancelled out and the resultant figure, expressed in percentage of cumulated average, will be a reasonably accurate index of any local deviation from normal due to the general weather situation. An illustrative example is given, and comments by C. F. Brooks are added.

Clouds and weather phenomena, C. J. P. CAVE (*Cambridge, Eng.: Univ. Press, 1943, [2. ed., rev.], pp. 22+, illus. 42*).—A semipopular account.

Evaporation from snow, A. R. CROFT. (U. S. D. A.). (*Amer. Met. Soc. Bul., 25 (1944), No. 8, pp. 334–337, illus. 2*).—Although the data reported are meager, rather high water loss by evaporation from snow on drainage basins of the Wasatch Plateau, Utah, was indicated. On experimental watersheds in the Intermountain region, where the influence of management practices on the amount and timeliness of water yields is being studied, it is essential that water loss from every source be ascertained. Thus a knowledge of the loss from this source will aid in obtaining a more complete understanding of the hydrologic cycle in these areas. Furthermore, in semiarid regions where irrigation water of extremely high economic value is derived largely from melting snow, loss by evaporation therefrom also may be significant from a practical standpoint. On such watersheds, where timber stands make up a substantial part of the vegetation it may be possible through cutting methods to control wind movement so as to decrease evaporation and increase stream flow.

Freezes of the winter of 1942–43, N. L. PARTRIDGE (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 54-59, illus. 6*).—The winter of 1942-43 was characterized by some extremely cold weather in Michigan, with five nights (January 19–20 and 26–27, February 14–15, and March 2–3 and 7–8) when severe temperatures were recorded in some portions of the fruit districts of the State. These data are summarized in relation to fruit tree injuries, and the distribution of minimum temperatures in the Lower Peninsula for the above nights and for the winter as a whole is shown in a series of maps.

SOILS—FERTILIZERS

Principles of soil sampling, M. G. CLINE. (Cornell Univ.). (*Soil Sci., 58 (1944), No. 4, pp. 275–288*).—According to the author's findings, the error due to sampling of soils is generally greater than that due to analysis. Statistics provide a basis for sound sampling procedure. The soil may be considered a population of sampling units that vary among themselves both vertically and horizontally. The first step in a sound sampling method is to subdivide the population into homogeneous strata. Within a homogeneous stratum the number of sampling units needed is a function of variance and required degree of accuracy and can be estimated from knowledge of the range or of variance by means of the relationship of *t* values to standard error and the maximum sampling error permissible. Complete randomization is necessary for estimates of significance or fiducial limits, but incomplete randomization gives an unbiased estimate of the mean. A selected sample may be most efficient for certain objectives. Time is an important factor in sampling for some objectives. Compositing of sampling units is an efficient expedient to obtain adequate numbers at low cost, but single composite samples can be used only if an unbiased estimate of the mean is the only objective.

Sampling tools are discussed with respect to their ability to provide unbiased and uncontaminated samples. Methods of reduction of the gross sample to a stock sample and subsampling for analysis should be based on the relationship of sampling error to particle size and size of subsample. A standard maximum particle size for chemical analysis is needed.

Determination of certain physical properties of forest soils.—II, Methods utilizing loose samples collected from pits, H. J. LUTZ (*Soil Sci., 58 (1944), No. 4, pp. 325–333*).—Because sampling with metal cylinders is commonly impractical, if not impossible, in stony soils (the cylinder being often damaged, the sample compressed by an included stone, or the sample left with a void by a stone forced outward by the cylinder edge), the author devised a technic by which pore volume, air capacity, field capacity, and volume weight may be measured without the use of metal cylinders.

The field volume of the sample (preferably from 1,000 to 2,000 cc., approximately) is determined by filling the pit left by its excavation with plaster of paris and subsequently weighing the hardened and water-saturated cast in air and in water. The absolute volume of the sample is measured in a large pycnometer, in accordance with the technic described by the author in the first paper of this series (E. S. R., 92, p. 14). Field capacity and volume weight may then be simply computed from the oven-dry weight, weight at field capacity (the condition in which the sample is to be taken), and the volume of the cast. Directions for computing pore volume, air capacity, and specific gravity are similarly given. Two cylinder methods are also detailed.

The data presented indicate that volume weight, pore volume, field capacity, air capacity, and specific gravity can be measured by the pit method, employing loose samples of soil, with essentially the same results as are obtained by the more precise of the two cylinder methods, employing samples of soil in place. The pit method therefore provides a means for investigating these physical properties in soils which, because of the presence of rocks, cannot be sampled by cylinders. For work in soils relatively free from rocks, however, the cylinder method is regarded as more convenient. Values for pore volume, air capacity, and specific gravity by the pit method differ from values for these properties obtained by the less precise of the two cylinder methods. The differences noted are essentially the same as those observed when values obtained by the two cylinder-method schedules are compared. That is, one of the cylinder methods results in low values for pore volume, air capacity, and specific gravity. This is explained by the fact that the volume of the soil material is less accurately determined in the first than in the second of the cylinder-method schedules and in the pit method. The two cylinder-method schedules and the pit method all lead to the same results for volume weight and field capacity.

Physical land conditions in the western and southeastern Baca County Soil Conservation Districts, Colorado, J. J. UNDERWOOD (*U. S. Dept. Agr., Soil Conserv. Serv., Phys. Land Survey No. 30 (1944), pp. 54+, illus. 16*).

An interpretation of the moisture content-surface force curve for soils, H. A. WADSWORTH. (Hawaii Expt. Sta.). (*Soil Sci., 58 (1944), No. 3, pp. 225–242, illus. 10*).—The author points out that in soils the inception of measurable capillary condensation is to be expected at low relative humidities. An apparatus for the measurement of the chemosorption curve must be capable of the location of many equilibria within a narrow range of low vapor pressures. He describes such a set-up and its experimental technic.

Of the two processes believed to operate concurrently in producing the sigmoidal curve expressing the soil moisture-vapor pressure relationships for soils and soil separates, one, which dominates the action at low vapor pressures, is a process of surface adsorption and is believed to follow a monomolecular adsorption law. At higher vapor pressures, water condenses in interstices between grains and accumulates rapidly as the vapor pressure approaches saturation for the given temperature. No experimental procedures permit the evaluation of these contributions during the determination of the curve's position; but mathematical analysis permits a distinction when the entire array of experimental points is available for study. Such analysis supported the hypothesis that sorption at low vapor pressures satisfies the monomolecular adsorption law mentioned above. There was some evidence indicating that the vapor pressure-moisture content curve is not a specific characteristic for a soil or a soil separate. Apparently the temperatures involved and the previous soil moisture history appeared so to condition the material that the position of the curve in the axis depends partly, at least, upon previous treatment of the sample.

Estimation of soil moisture conservation from meteorological data, W. J. Staple and J. J. Lehane (*Soil Sci., 58 (1944), No. 3, pp. 177–193, illus. 5*).—This paper describes a method for estimating moisture conservation in fallow soil. The method applies in dry areas such as southwestern Saskatchewan where the conserved moisture can be taken as the difference between the recorded rainfall and the evaporation loss from the soil surface. Other losses such as those from runoff or subsoil drainage are disregarded.

For the purpose of such estimates, the surface soil at field capacity is treated as a full reservoir with a constant volume equal to that occupied by 0.8 in. of water. As a further assumption, the reservoir is considered full when an air-dry loam soil receives 1.0 in. of rainfall, and empty (arbitrarily) when 0.8 in. of this moisture is removed by evaporation. The removable moisture in the surface soil may be found by means of experimentally determined evaporation curves in which removable moisture is plotted against evaporation from the standard free-water tank. Each curve starts with the removable moisture present immediately after a rain and traces the evaporation until the arbitrary zero point is reached. For each initial moisture content, the shape of the evaporation curve is determined by the amount of the recent rainfall. Separate curves for all combinations of rainfall and removable moisture (in units of 0.1 in.) likely to occur in the wetting and drying of field soils are provided.

The evaporation curves, as used to calculate the moisture conservation in fallow soils for the years 1922–41, gave results in satisfactory agreement with measured conservations both in soil tanks and in plats.

Oxidation loss of lowmoor peat in fields with different water tables, J. R. Neller. (Fla. Expt. Sta.). (*Soil Sci., 58 (1944), No. 3, pp. 195–204, illus. 3*).—Having determined experimentally the rate of aeration necessary to maintain atmospheric conditions in enclosed columns of peat comparable with natural conditions, the author varied the quantity of air drawn through the columns to correspond with the air volumes of the columns as varied by the height of a water table. He used hydrothermographs to obtain a record of the effect of height of water table on the temperature of the peat at different levels below the surface, as well as to ascertain the temperature of the peat throughout the year, since temperature is known to have an important effect upon the rate of oxidation of peat.

By means of controlled aeration the carbon dioxide produced in the columns of peat was determined for a 5-yr. period. For a given column the quantities produced did not vary much from year to year, nor were the variations excessive between duplicate columns. The rate of oxidation of the peat as shown by production of carbon dioxide depended to a striking degree upon the height of the water table. The production in the columns over 24- and 36-in. tables was approximately 9 and 14 times greater, respectively, than that in columns over a 12-in. water table. Oxidation of the peat over a 24–36 in. water table in a field that had never been plowed was equal to that of the peat in the cultivated field with a 36-in. water table.

The subsidence or diminution of the surface of the peat of these fields was in direct relation to the amount of oxidation as measured in the enclosed columns. The subsidence indicated a loss of peat greater than that accounted for by the carbon dioxide collected from the columns. Parallel determinations of the changes in volume weight and ash of the peat of the cultivated fields showed that only a small part of the losses of peat could be attributed to compaction. It is probable that despite the attempt to keep the oxygen-carbon dioxide ratio of the peat in the columns similar to that without, the aeration of the columns was not sufficient to permit a fully normal rate of oxidation. The volume weight and ash determinations indicated, however, that the subsidence of the peat was caused mostly by losses resulting from oxidation; and the experiments demonstrated that the extent of the oxidation depends upon the height of the water table.

Experiments in the control of soil erosion in southern New York, J. Lamb, Jr., J. S. Andrews, and A. F. Gustafson. (Coop. U. S. D. A.). (*[New York] Cornell Sta. Bul. 811 (1944), pp. 32, illus. 16*).—Experiments reported in this bulletin cover cooperative investigations by the station and the Soil Conservation Service at the Arnot Forest, 17 miles southwest of Ithaca, and on vineyard lands 1 mile west of Hammondsport. The results are applicable to the higher elevations, the Appalachian Plateau and the plateau border of southern New York, and also to the higher elevations of eastern New York and northern Pennsylvania. Climatic, soil, and agricultural conditions are described for each of the areas under study. Consideration is given to the effect of rainfall intensity and distribution on soil and water losses. The application of the results is made by the listing of practices that are destructive of soil productivity through heavy erosion losses and presenting practices that will give high production and still control excessive erosion. Some of the points of most effective erosion control under different natural and cropping situations are summarized in direct statements of application. Some of the conclusions presented are as follows:

Buckwheat and continuous corn permitted considerable loss of soil during June, July, and August, but land in meadow, oats, corn in rotation, and contour potatoes lost little soil. Erosive crops should be grown on the soils less subject to erosion. Leaving buckwheat stubble and straw on the surface reduced loss of water and soil; trashy cultivation should be practiced wherever feasible. Fertilization and rotation increase yields and reduce losses of water and soil.

Contour-planted potatoes lost less water and soil and (average 1935, 1938, 1940–43) produced 15 bu. an acre more tubers than did those planted up- and downhill; corn 5 bu. more. All crops should be planted on the contour, or as near it as feasible. Contour-strip-cropped land loses less water and soil than do long slopes in soil-exposing crops, even if they are seeded on the contour. Long slopes should be divided into narrow strips (about 75 ft. on a 15-percent slope) and alternate soil-protecting (meadow) with soil-exposing crops (corn or potatoes). Well managed and fertilized thrifty pastures retain water and protect the soil. Seeding, fertilizing, and liming should be so done as to maintain a high-producing, thick, soil-protecting sward.

Erosion on steeply sloping vineyard lands has been severe, and further rapid erosion must be checked if productivity is to be maintained. Contour-planted grapes lost less water and soil and, in general, produced more fruit than did those planted up- and downhill. New vineyards should be planted on the contour. Cover crops help to hold soil and water, but they compete with the grapes for moisture. A mulch of straw or spoiled or wet-land hay aids materially in obtaining a stand and in promoting growth of new vines on badly eroded old vineyard lands. The mulching of producing vines increased yields at first. More information is needed concerning long-term effects on yield, quality of fruit, and winter injury caused by late fall growth.

Soil testing available to State farmers, R. COWART (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 10, pp. 1, 8*).—This article presents the procedure to be followed to have soils analyzed and explains how the results of the analysis are used as the basis for making recommendations for soil treatments for maximum crop production.

Soil reaction (pH): Some critical factors in its determination, control, and significance, G. M. VOLK and C. E. BELL (*Florida Sta. Bul. 400 (1944), pp. 43, illus. 11*).—This bulletin covers the effect of pH in certain physiochemical reactions related to nutrient retention and solubility in the soil. In connection with the determination of pH, the following factors are considered: Effect of air-drying the soil; effect of soil-water ratio; effect of stirring the suspension; and colorimetric methods as compared to the standard method. Factors in the adjustment and maintenance of pH are considered in relation to pH control. Soil pH was not found to be a reliable criterion of percentage of base saturation determined by ammonium acetate extraction. Solubility of phosphorus residuals in soils of Norfolk and similar types of peninsular Florida may be expected to increase with rise in pH in the general range, pH 5.0 to 8.0, except where lime complicates the relationship. An increase in lime content in the range pH 5.5 to 8.0 tends to reduce solubility in water or carbonic acid, as compared to its effect on solubility of phosphorus in dilute H_2SO_4.

A method for determining the total exchangeable bases of soils, C. PENG and T. S. CHU (*Soil Sci., 58 (1944), No. 3, pp. 205–208*).—A method consisting essentially in the leaching of 10 gm. of the soil with 400 cc. of 0.5 N acetic acid was critically examined and shown not to effect complete removal of the exchangeable bases. Even 1,200 cc. of the same leaching reagent failed in some instances to carry the extraction to completion. Extraction of the soil samples with the same reagent for from 6 to 9 hr. in a Soxhlet apparatus brought about a much closer approach to quantitative removal of the bases, and reducing the weight of soil taken to 5 gm. and to 2.5 gm. further increased the percentage of extraction. It was found preferable to use 0.1 N acetic acid in place of the stronger solution, which appeared to have some solvent action upon the exchangeable complex itself. Since the volume of the extractant can be reduced to 100 cc., the time required for evaporation is much shorter, and chances of contamination are lessened. The disadvantage is the prolonged extraction necessary for a complete removal of the exchangeable bases; a difficulty easily overcome, however, by carrying out the extraction overnight in an electrically heated Soxhlet apparatus.

Saline soils, their nature and management, O. C. MAGISTAD and J. E. CHRISTIANSEN (*U. S. Dept. Agr. Cir. 707 (1944), pp. 32+, illus. 4*).—The extent of the problem of saline soils is indicated by the fact that a large part of the 20 million acres under irrigation in the 19 western States contains enough soluble salts to depress crop yields. The research reported in this circular represents investigations by the U. S. Regional Salinity Laboratory, in cooperation with the agricultural experiment stations of the 11 western States and Hawaii. Special consideration is given to the methods of formation of saline soils, black alkali soils, the soil solution, irrigation waters, recognizing and delimiting saline lands, relation of crop growth to salinity, tolerance and suitability of particular crops to saline conditions, reclamation of saline soils and prevention of salt accumulation, cultural practices on saline soils, irrigation methods and their relation to salinity, and sampling data for salinity analysis. A special feature of the circular is the presentation of a glossary of terms used in connection with saline soils.

Air and soil temperatures in a California citrus orchard, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Soil Sci., 58 (1944), No. 4, pp. 259–274, illus. 4*).—Temperatures of air and soil in a Valencia-orange orchard near Anaheim, Calif., were recorded from February 1939 to July 1943. The data are summarized as weekly mean temperatures and as yearly ranges. Wide variations in the range of daily temperature fluctuations in the air and in the soil near the surface were associated with different meteorological conditions.

The relations of air and soil temperatures in summer at Anaheim and at Indio, Calif., are discussed.

Perennially frozen ground in Alaska: Its origin and history, S. TABER (*Bul. Geol. Soc. Amer., 54 (1943), No. 10, pp. 1433–1548+, illus. 35*).—The climate and vegetation in the region of perennially frozen ground are briefly described, to explain more fully the geologic processes now characteristic of the region and the changes in late Tertiary and Quaternary time. Special attention is given to frost action in rock weathering. Laboratory experiments help explain rock disintegration by frost action and also the movements of rock waste that result from the freezing of water-saturated soils. Decomposed bedrock, under unaltered gravel of local origin, shows that the climate was conducive to rock decay prior to gravel deposition. The distribution and appearance of gold and other minerals furnishes additional evidence on the weathering of bedrock. The physical and chemical characteristics of the gravels and silts, together with their fossil content, indicate the origin of these deposits as well as the climate and other environmental conditions at the time of deposition.

Since the origin of the silts has long been a problem, they were given detailed study both in the field and in the laboratory. Evidence indicates that the creek-valley silts are flood plain deposits, formed largely from the local country rock, which, over large areas, is especially susceptible to disintegration by frost action. The gravels were deposited during a cool, arid climate, and the silts during a cool, humid climate. Deep freezing, accompanied by the formation of ground ice in the silts, occurred subsequently. Ground ice occurs mostly in the form of layers or lenses and of wedgelike veins that commonly form a polygonal network enclosing silt columns. The veins, in places, join layers above and below to form a cellular structure. These structures have been produced on a small scale in laboratory experiments. Both observation and experimentation indicate that the ground ice has been formed by segregation during progressive freezing from the surface downward.

The determination of the volume and air space of soil clods, E. W. RUSSELL and W. BALCEREK (*Jour. Agr. Sci. [England], 34 (1944), No. 3, pp. 123–132*).—A method is described for determining the field volume and air space of a clod of any shape by filling its pores with a hydrocarbon oil, such as paraffin or tetralin, and determining its weight in the oil and in air before and after impregnation. The method is shown to work well for clods of any moisture content and gives values of these volumes entirely comparable with those given by the other methods described in the literature. The accuracy for clods of Rothamsted soil weighing between 20 and 500 gm. was probably at least 1 part per thousand, i. e., 0.1 percent. The method has been applied to the determination of the available water held by a soil, and has been used to illustrate the effect of long-continued applications of farmyard manure to a soil in increasing the amount of available water it can hold.

Soil colloids, II–IV (*Soil Sci., 57 (1944), Nos. 3, pp. 233–240; 4, pp. 243–246; 58 (1944), No. 1, pp. 79–84*).—The first paper of this series[1] presented a review of some theories concerning the formation, structure, and behavior of the soil colloidal complex. The three papers here noted deal with applications of a system of fractionation, attributed to Tyulin, in which group 1 includes those colloids that are dispersed in distilled water after being saturated with Na ions. Group 2, subgroup "a," contains those colloids which, following the removal of group 1, are dispersed in 0.004 N NaOH. Group 2, subgroup "b," consists of those that are dispersed in weak alkali following the removal of group 2a and subsequent treatment of the residual soil with weak acid.

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[1] Sci. Agr., 23 (1943), No. 5, pp. 273–286.

II. *Separation by peptization,* H. J. Atkinson and R. C. Turner.—From each of the groups above defined, there were separated a first humate fraction, representing loosely bound organic matter, and a second humate fraction, or organic matter more firmly attached to the colloids. Details of the methods used are given, and some results obtained on soils of medium texture, taken from different soil zones, are presented.

The greatest variation was in the size of the group 1 fraction, from 1.1 to 19.3 percent. The variation in the quantities of group 2a was less, and the percentages of group 2b were in general the smallest and showed the least variation between soils. The results indicated that the relative quantities of group 1 and group 2 colloids may depend on the completeness of the separation of the first group. It is suggested that it may not be necessary, in order to get comparable results, to make the separation of the different groups as complete as indicated in the method given. The residues, after separation of the groups, retained from 30 to 60 percent of the capacity to absorb bases possessed by the original soil.

III. *Relationship to soil fertility,* H. J. Atkinson, R. C. Turner, and A. Leahey.—Greenhouse studies were carried on for 3 yr. on seven Canadian soils of medium texture and representative of five soil zones. Yields of barley for 2 yr. and those of clover for 1 yr. were measured.

A highly significant relationship was found between the yields and the quantity of group 1 colloids obtained from the soils. This relationship was somewhat closer than that between yields and percentage of nitrogen in the soil, or than that between yields and percentage of carbon. Tyulin's contention that it is the first humate fraction of group 1 colloids that is the important one from the point of view of soil fertility was supported by these observations.

IV. *Distribution and availability of phosphorus,* H. J. Atkinson, R. C. Turner, and R. F. Bishop.—In the further work here reported upon, it was found that the distribution of phosphorus among the Tyulin groups of soil colloids varied considerably among a number of Canadian soils. The phosphorus in the colloids of group 1 was found to amount to from 8.6 to 47.7 percent of the total phosphorus of the soil in the seven samples examined. The largest fraction was sometimes in group 1, sometimes in group 2a, and in one case in group 2b. There appeared to be no relationship between the total soil phosphorus and the phosphorus uptake by plants, or between total soil phosphorus and that part of the total found in group 1. There was, however, an apparent relationship between the phosphorus taken up by the plants in the greenhouse (results of 3 years' work) and the percentage of the total soil phosphorus found in group 1 colloids. Samples of untreated soils from three locations were compared with corresponding samples from adjacent areas where the total phosphorus had been appreciably increased by phosphatic fertilizers over a period of years. For the three untreated soils, a relationship between the phosphorus of group 1 colloids and the available phosphorus as determined by the Neubauer method (E. S. R., 53, p. 319) was indicated. In the treated samples, it was shown that the added phosphorus appeared in group 1 colloids in two soils but was found in the residue after separation of the groups in the third. Where the added phosphorus appeared in group 1, the available phosphorus as determined by the Neubauer method was considerably greater. On the other hand, where the added phosphorus was found to be in the residue, there was no appreciable increase in the Neubauer value. All the results have thus indicated the importance of the phosphorus of the group 1 colloids from the point of view of the availability of soil phosphorus to plants.

Interaction between roots and soil colloids as one of the problems of the physiology of mineral nutrition of plants, I, II, E. I. RATNER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 7, pp. 313–317; 43 (1944), No. 3, pp. 126–130*).—The experiments described in these papers are concerned with the interaction between roots and soil colloids, and the effect of age of plant on this process.

I. *Unstable equilbria in the cation exchange between the roots of plants and the soil colloids.*—Five experiments are described to illustrate the interactions between soil and plant colloids. Barley plants were grown in water cultures, with various concentrations of potassium in the nutrient solution, for a 3-week period, so as to obtain plants varying as to potassium saturation. After the 3-week growth period, the plant roots were thoroughly washed and the plants were set in different solutions. One was a KCl solution; another an especially prepared suspension of soil saturated to 10 percent of its exchange capacity with potassium and 90 percent saturated with calcium. After a 48-hr. interaction of the roots with the source of potassium, the plants were subjected to analysis for the content of potassium. It was found that when the saturation of the plants with potassium is the lowest, their activity in desorbing this element from the soil's colloidal complex is very strongly pronounced. When the experimental saturation is a medium one, the plants are found scarcely capable of desorbing this cation from the colloidal complex of the soil, although its absorption from a KCl solution proceeded very intensely. And finally, with a further increase of the saturation of the plants with potassium, there is already desorption of this element by the soil from the plant.

II. *Age variations in the fixing capacity of the plasm.*—Barley grown in nutrient solution to the stages of tillering, flowering, and ripening of seed was removed and the roots thoroughly washed and replaced in contact with a suspension prepared with chernozem saturated to 30 percent with Ca and to 70 percent with Na. The plants were left to interact for 36 hr. In another experiment, the plants were immersed with their roots in distilled water. The results show that the fixing ability of the plant with respect to the cations undergoes reduction as the plant grows older. This statement is illustrated by the behavior of the plants as soon as these are transferred to water, for older plants lose thereby an appreciable portion of the cations they contain while the younger ones fail to do so. This difference becomes still more salient, however, when the roots are made to interact with soil suspension. The other experiments reported cover similar experiments with other cations.

Physicochemical properties of ferroaluminosilicates as allied to soils, A. N. PURI, B. RAI, and R. P. VERMA (*Soil Sci., 58 (1944), No. 3, pp. 209–224, illus. 6*).—Certain physiocochemical properties (as behavior under dispersion treatment, mechanical analysis, moisture absorption at different humidities, titration curves, activity of acidoid in silicate mixtures, and ammonia absorption) of laboratory-prepared mixtures of iron and aluminum silicates of varying compositions were found to resemble those of soil colloids in all essential respects. Clay and ultraclay could be produced from the silicates in the same way as in soils. Moisture absorption curves and titration curves of the silicate mixtures were in no way different from similar curves of soil colloids. The acidoids in the mixtures catalyzed hydrolytic reactions in the same way as do soil acidoids or true acids. The proportions of ammonia absorbed by the mixtures are equivalent to their respective base-neutralizing powers, just as with soil acidoids or with true acids.

Phosphate fixation by soil minerals: Mica and related groups, A. T. PERKINS and H. H. KING. (Kans. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc., 8 (1943), pp. 154–158, illus. 1*).—The authors determined the phosphate fixation of a number of minerals of similar structure (pyrophyllite and talc; muscovite, phlogopite, and biotite of the mica group; margarite of the clintonite group; and kaolinite) and ground to approximately the same particle size, from pH 2.5 to pH 7.5 at each 0.5-pH unit step.

These data indicate that phosphate fixation is related to the nature of the cations in the minerals, their position in the mineral structure, and the quantities present. Major phosphate fixation by this group of minerals appears to depend on structural or anionic aluminum (AlO_3—). A minor phosphate fixation is attributed to cationic aluminum or magnesium and, possibly, the hydroxy radical. X-ray diffraction photographs of muscovite indicate that phosphate fixation is accompanied by the spreading of the space lattice.

Phosphate fixation by soil minerals.—II, Fixation by iron, silicon, and titanium oxides, A. T. PERKINS and H. H. KING. (Kans. Expt. Sta.). (*Soil Sci., 58 (1944), No. 3, pp. 243–250*).—Fixation data presented for 100-mesh minerals are shown to indicate that the mica groups constitute the chief mineral species responsible for phosphate fixation by particles in the fine sand range. With 100-mesh minerals, the pH for maximum phosphate fixation was about 3.5, which is far below the pH value at which Ca and Mg are active. This value approximates a value given for minimum solubility of iron and aluminum phosphate, indicating that iron and aluminum probably are important in phosphate fixation by these minerals. No phosphate was fixed by 100-mesh magnetite, but considerable quantities were fixed by limonite and hematite, observations which are held to show that the chemical form in which the iron oxide exists in the soil is of great importance in phosphate fixation.

Carbonic acid soluble phosphorus and lime content of Idaho soils in relation to crop response to phosphate fertilization, L. E. ENSMINGER and H. W. E. LARSON. (Idaho Expt. Sta.). (*Soil Sci., 58 (1944), No. 4, pp. 253-258*).—For the purpose of correlating the characteristics named, the authors set up the arbitrary categories of known crop response to phosphate fertilization: No response, low, medium, and high response. Approximately one-half of the soils of the irrigated areas of southern Idaho gave a medium or high response to phosphate fertilization. The authors determined in such soils the carbonic-acid-soluble phosphate (phosphate dissolved from 10 gm. of soil in 100 cc. of distilled water by bubbling carbon dioxide through the suspension for 20 min.) and the "lime" content (acid-liberated CO_2 calculated as calcium carbonate).

The difference between the mean phosphoric anhydride values of the combined medium- and high-response categories and the combined low- and no-response categories was highly significant. Soils in the medium-response category were significantly higher in soluble P_2O_5 than soils in the low-response category. There was no significant difference between the means of the high- and medium-response categories or between the means of the low-and no-response categories. Carbonic-acid-soluble P_2O_5 was highest in the lime ranges which showed the lowest response, and vice versa. Also, there was no significant change in soluble P_2O_5 with increasing lime content in the lime ranges greater than 1.0–<2.0 percent.

Soils containing 0.5–<1.0 percent lime showed the lowest response to phosphate fertilization, and the mean response of these soils as compared to the mean response of the soils in the 1.0–<2.0 percent lime range was highly significant. Beyond the 1.0–<2.0 percent lime range there was no appreciable change in response with increasing lime content. Soils containing less than 0.01 percent lime gave as great a response as soils containing more than 1.0 percent lime.

Some factors affecting the utilization of phosphoric acid in soils by plants in pot experiments, G. S. FRAPS and J. F. FUDGE (*Texas Sta. Bul. 647 (1944), pp. 29*).—The average quantities of phosphoric acid removed per crop by corn and milo or kafir increased with the phosphoric acid soluble in 0.2 N nitric acid when the soils had a basicity of less than 2 percent. When the basicity was over 2 percent, the quantities of phosphoric acid removed by the crops increased with the total phosphoric acid of the soil. The quantities of phosphoric acid removed per crop from surface soils which contained similar quantities of active phosphoric acid were greater than those removed from subsoils. With similar quantities of active phosphoric acid, the quantities of phosphoric acid removed by the crops increased with increases in total phosphoric acid, in total nitrogen, and in active potassium. It is held that the phosphoric acid removed came either directly or indirectly from soil compounds in which the phosphoric acid was insoluble in 0.2 N nitric acid, since the quantities of active phosphoric acid in some soils were practically the same before and after cropping. Soils varied widely with respect to the availability of their total phosphoric acid. The availability of the total phosphoric acid in some soils was higher than in rock phosphate, though not as high as in superphosphate. Availability of total phosphoric acid was higher in calcareous than in noncalcareous soils. A crop of corn recovered from 20 to 30 percent of the phosphoric acid fixed from solution by various soils.

Soil-plant relations.—I, The quantitative relation of exchangeable potassium to crop yields and to crop response to potash additions, R. H. Bray. (Ill. Expt. Sta.). (*Soil Sci., 58 (1944), No. 4, pp. 305–324, illus. 2*).—The quantity of exchangeable potassium in the surface soils of the Corn Belt was found directly related to the ability of the soil to supply K to crops. This relationship could be expressed by the equation: $\text{Log}(A-y) = \log A - c_1b_1$, in which A = yield in bushels when K is not deficient, y = yield obtained when b_1 = amount of exchangeable K in surface soil, and c_1 = a proportionality constant. The above relationship held with approximately the same value for c_1 when many physical and chemical soil properties varied within a rather wide range and when the ultimate yields under full treatment also varied considerably. A cobaltinitrite soil test for exchangeable K described in this paper measured the total exchangeable K with the accuracy necessary to establish the relationship expressed above. By means of soil testing the above relationship can be applied to each farm field, under soil conditions existing in the great majority of the soils in the Corn Belt, to ascertain if K is needed; the approximate magnitude of the deficiency and the percentage yield being obtained without added K; approximately how much crop yields will be increased by the use of adequate amounts of K; and the approximate potash requirement.

The values of c_1 obtained for corn, legumes, soybeans, and wheat did not support the theory of a constant c value for all crops.

Comparison of mixed fertilizers produced from various nitrogen and phosphoric acid sources, R. P. Bartholomew (*Arkansas Sta. Bul. 450 (1944), pp. 30+*).—Results cover investigations at the Cotton Branch Experiment Station on Richland silt loam to determine the efficiency of neutral fertilizers, the efficiency of acid-forming fertilizers, the effect of calcium, magnesium, sulfur, and manganese content of fertilizers on their efficiency, the relative efficiency of phosphates of different solubility, and the influence of different proportions of ammonium and nitrate nitrogen on the efficiency of the fertilizer.

Acid and neutral fertilizers containing 36 lb. of nitrogen, 60 lb. of phosphoric acid, and 24 lb. of potash were applied under cotton, in order to determine the relative effectiveness of the mixtures in producing increased yields of cotton. A fertilizer made from ammonium sulfate, superphosphate, and muriate of potash was used as a standard for comparison. Ammonium nitrate was the chief source of nitrogen used either as the only source of nitrogen or to supplement the nitrogen contained in the phosphates. Urea and sodium nitrate were also used in a few mixtures to supplement the nitrogen in diammonium phosphate. Phosphoric acid was supplied as monoammonium phosphate, diammonium phosphate, ammoniated superphosphate, magnesium ammonium phosphate, superphosphate, dicalcium phosphate, tricalcium phosphate, and rock phosphate. Muriate of potash was used mostly for the source of potash, but in three mixtures half of the potash was added as the sulfate. Finely ground limestone was used in all mixtures to make physiologically neutral fertilizers, although in three, half of the basic material was added as magnesium carbonate.

No mixture stood out as being superior to all other mixtures in the evaluation of the average results of 13 yr. However, there was considerable variation in yields of seed cotton produced from the different mixtures, and significant differences were noted between certain mixtures. The standard mixture—ammonium sulfate, superphosphate, and muriate of potash—produced an average increase in yield of 421 lb. of seed cotton per acre. About one-fourth, 107 lb., of the increase was attributed to the phosphoric acid and three-fourths to the nitrogen and potash in the mixture. Two mixtures of the acid group produced significantly larger yields of seed cotton than the standard. One made from nitrate of soda, diammonium phosphate, and muriate of potash produced 115 lb. more of seed cotton per acre, and the other, mixed from ammonium nitrate, dicalcium phosphate, and muriate of potash, produced 47 lb. more. Four of this group of mixtures produced significantly smaller yields than the standard, and four were considered as of equivalent value.

Mixtures made from the same materials as the acid fertilizers plus limestone or limestone and magnesium carbonate to make neutral fertilizers all produced larger yields than the same mixtures without basic materials. The average increase ranged from 13 to 120 lb. of seed cotton per acre. The effectiveness of all of the mixtures was increased as a result of the addition of basic materials. The increases in yields were not, in all cases, significant. All physiologically neutral complete fertilizers produced more seed cotton than the physiologically acid standard. The value of the neutralizing material is shown by the fact that four of the same mixtures, but without limestone, produced significantly smaller yields than the standard.

Tests of four nitrogen-carriers in a mature apple orchard at Martinsburg, West Virginia, R. H. SUDDS (*West Virginia Sta. Bul. 315 (1944), pp. 23, illus. 5*).—Chilean nitrate of soda, sulfate of ammonia, cyanamide, and urea were evaluated for an 8-yr. period in a commercial apple orchard of 25-yr.-old York Imperial apple trees located on Frankstown gravelly silt loam at the northern end of the Shenandoah Valley. The basic rate of application of the nitrogen carriers was 7 lb. per tree per year of Chilean nitrate of soda or its nitrogen equivalent in one of the other materials. There were no significant differences in yields for the 8-yr. period between any of the four nitrogen carriers. The trunk circumferences, which averaged almost the same for all of the four groups, at the start, were practically as close at the end. The effect of each nitrogen carrier on soil reaction is discussed briefly.

Any of the four materials tested will serve as a satisfactory source of nitrogen in apple orchards in West Virginia, if certain precautions are observed: (1) Lime should be used as necessary with the two carriers, sulfate of ammonia and Uramon, which tend to increase soil acidity. (2) As a precautionary measure, cyanamide should be applied in the autumn, not in the spring, and distributed over the entire tree squares or triangles. While nitrate of soda would be expected to give a greater response in blossom-time applications, all of the materials were usually applied at least 2 weeks before bloom, so that the carriers with more slowly available nitrogen, such as sulfate of ammonia, Uramon, and cyanamide, performed to equal advantage.

Commercial fertilizers in Kentucky in 1943, J. D. TURNER, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul. 38 (1944), pp. 55*).—In addition to the regular fertilizer-control and sales statistics and analyses, this bulletin contains a discussion on the relation between soil fertility and quality of feeds grown.

Fertilizers for Kentucky, 1944–45, P. E. KARRAKER (*Kentucky Sta., A. Mim. 128 (1944), pp. 7, illus. 1*).—A detailed presentation of fertilizer recommendations for field crops.

Commercial fertilizers, 1944, E. R. TOBEY (*Maine Sta. Off. Insp. 193 (1944), pp. 47–86*).—Analytical data resulting from the 1944 inspection of commercial fertilizers are here recorded.

AGRICULTURAL BOTANY

American botany, 1873–1892: Decades of transition, A. D. RODGERS III (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press, 1944, pp. 340+, illus. 3*).—"This book seeks to extend the boundaries of enterprise striving foremost toward arriving at a truthful interpretation of the American scientific scene during two important decades of the last century, confined and limited, however, to . . . American botany."

[Studies in applied biology] (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20 (1941–42—1942–43), pp. 3, 20–21, 23, 33–34, 49–53*).—The following abstracts and papers are included: Preliminary Report—Potatoes as a Source of Lactic Acid by Fermentation, by K. R. Stevens and A. E. Western (pp. 3, 33–34) (Utah Expt. Sta.); Some Characteristics of the Seed Oil From *Lepidium draba* (White Top), by A. J. Johanson and C. W. Whitehead (pp. 20–21, 51–53); and The Joshua Tree Flower as a Source of Food, by A. M. Woodbury, M. Noall, C. H. Kinney, and J. Sugihara (pp. 23, 49–50).

Studies in the mechanism of bacterial adaptation, D. S. DAVIES, C. N. HINSHELWOOD, and J. M. PRYCE (*Faraday Soc. Trans., 40 (1944), No. 9, pp. 397–419, illus. 13*).—The data from studies of the action of proflavine on *Bacterium lactis aerogenes* are interpreted by postulating that it interferes with the synthesis of the essential growth factor normally found in the filtrate, and that adaptation occurs by an expansion of the enzyme responsible for its production. The mechanism by which this expansion can occur—in a difficultly reversible manner—is considered. The action of methylene blue generally resembled that of proflavine, adaptation to the dye occurring readily. Certain differences in the effects of the two dyes are discussed. Determination of the lag-age relationships indicated that this bacterium, when immunized by serial subculture in the presence of proflavine, is also immune to methylene blue; the reverse was also true. With certain exceptions noted, the action of crystal violet was similar to that of proflavine. Cells adapted to resist sulfonamide were not at all trained to proflavine. Profiavine immunity may be conferred on these cells, but some of their sulfonamide immunity may be lost in the process. On the other hand, proflavine-trained cells may also acquire immunity to sulfonamide without losing it to proflavine. A simple working model of two coupled enzymes is presented to explain some of the salient facts of bacterial adaptation. Discussion of the assumptions on which it is based and consideration of the respects in which it is incomplete suggest further lines of investigation. Adaptation to proflavine did not occur during the lag phase but under optimum conditions became almost complete during the first few divisions taking place in the presence of the drug. Adaptation was retarded neither by increased acidity of the medium nor by accumulation of the lag-removing diffusible cell product, but conditions of growth favoring the formation of long snakelike cells seemed to cause retardation or even reversal.

Effect of cancerogenic substances upon microbic cell, M. N. MEISSEL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 9, pp. 399–400*).—The author tested the effects of benzpyrene, methylcholanthrene, and orthoaminoazotoluol on cultures of the yeasts—*Saccharomycodes ludwigii, Saccharomyces cerevisiae,* and *S. coreanus,* as well as on certain sporulating and nonsporulating bacteria. The alterations in morphology of vegetative cells and spores—many of them heritable—are briefly described.

Cellulose-digesting bacteria in Amitermes [minimus—a wood-eating termite], R. E. HUNGATE (*Jour. Bact., 48 (1944), No. 3, pp. 380–381*).—An abstract.

Measuring the growth of Azotobacter, P. L. GAINEY. (*Kans. Expt. Sta.*). (*Jour. Bact., 48 (1944), No. 3, pp. 285–294, illus. 9*).—The criteria for growth employed in studying this soil organism were increased in cell numbers, turbidity, volume of cells, and H^+ concentration of the medium and decrease in the energy substrate present therein. During active cell proliferation, growth curves plotted from quantitative changes in the various criteria were of the same general form, indicating that during active growth phases in a growth cycle any one of the criteria gives a relative measure of growth. Following the period of active cell reproduction such curves may or may not show a positive correlation. Furthermore, if a culture is placed under such conditions that cell proliferation is inhibited while other physiological activities can continue, marked increases in turbidity and H^+ concentration and marked decreases in the energy substrate (or of other nutritive constituents, notably NH_4) may take place unaccompanied by any increase in cell numbers. It is thus obvious that alterations in turbidity, H^+, and energy substrate cannot be relied upon alone as criteria of growth so long as the term is restricted to increases in cell numbers; typical "growth curves" were plotted from such data in the absence of any increase in cell numbers. Data are submitted as showing that even during the logarithmic growth phase, when curves plotted on the basis of the various criteria are of the same general form, the quantitative relationship between cell numbers and other criteria (e. g., cell numbers/turbidity) may be so variable that the growth rates of two strains of the same species of *Azotobacter* cannot be accurately compared by the indirect (turbidity) method. The information here presented suggests caution in applying unchecked indirect methods of measuring or comparing growth rates (increase in cell numbers) of bacteria cultures, unless the indirect method has been standardized for the particular culture and conditions under which it is to be used.

Comparison of the morphology of Bacillus megatherium with light and electron microscopy, I. N. DUBIN and D. G. SHARP (*Jour. Bact., 48 (1944), No. 3, pp. 313–329, illus. 11*).—Images in the electron micrographs indicated plainly the presence of an inner dense and an outer less dense substance of the bacterial cell; the latter was invisible in the light micrographs. This dissimilarity in appearance is said not to result from a difference in magnification but rather from a difference in light and electron optics. No significant differences in measurements of unstained air-dried bacteria were found by the two technics; measurements obtained by the Benian Congo red method, however, were less than those of the total bacterial substance as seen in the electron micrographs, showing that Benian's method fails to outline the whole bacterial cell.

Contribution a l'étude botanique et biochimique des bactéries du genre Bacillus (premier mémoire): Valeur du test de l'acétylméthycarbinol pour la caractérisation des espèces [Value of the acetylmethylcarbinol test for characterizing species of the genus Bacillus], M. LEMOIGNE, B. DELAPORTE and M. CROSON (*Ann. Inst. Pasteur, 70 (1944), No. 3–4, pp. 65–79*).—It is concluded that this test, rigorously standardized, may be of use in distinguishing members of the genus, but that its value is limited.

New Zealand seaweed for agar manufacture, L. B. MOORE (*New Zeal. Jour. Sci. and Technol., 25 (1944), No. 5, Sect. B, pp. 183–209, illus. 16*).—Following the uncertainty of supplies of agar from Japan after the outbreak of the war, investigations in New Zealand established that *Pterocladia lucida* and *P. capillacea* are available there in promising quantities, that renewal after harvesting is satisfactory, and that agar of good quality can be made from them. The two species are described and the factory process in operation since July 1943 is outlined. Various further information is also presented regarding these and other seaweeds.

Bacteriological tests on agar made from Australian seaweed, H. L. JENSEN (*Bul. Imp. Inst. [London], 42 (1944), No. 2, pp. 69–74*).—It appeared from this study that, in general, agar from Australia seaweed can with proper purification be obtained of a quality satisfactory for almost any bacteriological work except where it is essential that the medium be cooled to 45° C. or less before setting. In comparison with the Japanese product it has the advantage of a remarkably tough and elastic structure, making it very convenient for streaked plates; its disadvantages are also enumerated.

Volatiles evolved by flowers and leaves as a source of nutriment for microorganisms, N. G. CHOLODNY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 2, pp. 71–74*).—On the basis of experiments with emanations from the flowers of various plants the author concludes that these complex organic compounds may be utilized as nutrient sources—chiefly by ordinary bacteria but to a lesser degree by actinomycetes and fungi.

Inhibition of bacterial growth by d-leucine, S. W. FOX, M. FLING, and G. N. BOLLENBACK. (Iowa Expt. Sta.). (*Jour. Biol. Chem., 155 (1944), No. 2, pp. 465–468*).—Growth inhibition of a strain of *Lactobacillus arabinosus* by a *d*-amino acid isomer of a natural amino acid, *l*-leucine, required for growth of the same strain, was demonstrated. The significance of this finding with respect to the peptide antibiotics is discussed.

The production of penicillinase by organisms of the subtilis group, E. S. DUTHIE (*Brit. Jour. Expt. Pathol., 25 (1944), No. 3, pp. 96–100*).—A stable extracellular penicillinase was produced in good quantity by these bacteria in liquid media when penicillin was added during or at the end of the growth phase. Methods of determining the enzyme activity and amounts required for routine culture media are described.

Penicillin-like antibiotics from various species of moulds, H. W. FLOREY, N. G. HEATLEY, M. A. JENNINGS, and T. I. WILLIAMS (*Nature [London], 154 (1944), No. 3904, p. 268*).—The authors report antibiotics produced by *Penicillium fluorescens, P. rubens, P. avellaneum, P. baculatum,* and *P. turbatum.*

Enhanced production of penicillin in fluid medium containing cellophane, G. SHWARTZMAN (*Science, 100 (1944), No. 2600, pp. 390–392, illus. 2*).—Gains in both rate of production and total yield of penicillin were obtained by this method. There was also a markedly stabilizing effect of cellophane on the H-ion concentration of abundantly growing cultures of *Penicillium notatum* during active production of penicillin—an important factor, since the sharp rise in pH usually occurring tends to rapidly destroy the penicillin.

Ergosterol from some species of Penicillium, C. J. CAVALLITO (*Science, 100 (1944), No. 2598, p. 333*).

Additional records of aquatic Phycomycetes isolated from Mexican soils, L. SHANOR. (Univ. Ill.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 10, pp. 330–333*).—To date, five orders of aquatic members of this group are said to be represented among the fungi that have been collected in Mexico (14 references); this paper records other aquatic Phycomycetes isolated from Mexican soils, adding representatives of two more orders. The resumé of species includes collection data submitted with the soil samples from which the isolates were made. All but 3 of the 14 species included have apparently not been reported previously from Mexico.

New or heretofore unreported species of the higher Ascomycetes from Colombia and Venezuela, C. G. OREJUELA. (Cornell Univ.). (*Mycologia, 36 (1944), No. 5, pp. 429–459*).—The author reports on 50 species—38 from Colombia and 14 from Venezuela, with 2 occurring in both countries; of these, 16 are new species, the others being heretofore unreported or recorded for the first time on new hosts or from new localities.

Additions to the Uredinales of Venezuela, IV, F. D. KERN and H. W. THURSTON, JR. (Pa. Expt. Sta.). (*Mycologia, 36 (1944), No. 5, pp. 503–517*).—This report (E. S. R., 91, p. 20) adds 30 species to the Venezuelan rust list, bringing it to the present total of 292; new nomenclature occurs in 13 of the 30 added species.

Mushrooms of the Great Lakes region: The fleshy, leathery, and woody fungi of Illinois, Indiana, Ohio, and the southern half of Wisconsin and of Michigan, V. O. GRAHAM (*Chicago Acad. Sci., Spec. Pub. No. 5 (1944), pp. 390+, illus. 866*). —This manual includes keys to the genera and species belonging to the various families of the Ascomycetes and Basidiomycetes, a dictionary of terms, and an index to the genera and species treated in the descriptive text, which includes habitat data. The work was published under the joint auspices of the Chicago Academy of Sciences and the Chicago Natural History Museum.

The discriminant function applied to spore measurements, W. D. BATEN. (Mich. Expt. Sta.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 29 (1943), pp. 3–7*).—This presents three methods of testing for significant differences between arithmetic averages of fungus spore measurements, particular emphasis being given to 99 percentage ellipses and the discriminant function. These methods indicate how two averages pertaining to one species may be compared with two similar averages pertaining to another. The discriminant function enables a comparison of several averages from one species with similar averages from another.

Pollen frequency of Abies and Picea in peat: A correction on some published records from Indiana bogs and lakes, J. E. POTZGER (*Butler Univ. Bot. Studies, 6 (1944), Papers 9–14, pp. 123–130*).

Taxonomy of the Liliaceae as based on phytoconstituents, E. P. CLAUS (*Pa. Acad. Sci. Proc., 18 (1944), pp. 24–29*).—The distribution of the genera of the lily family in each of three taxonomic systems was found to correspond favorably to the phytoconstituents of those genera. The taxonomy of this family as based on phytoconstituents apparently substantiates—in most instances—that based on morphological characteristics.

A partial listing of the flora of Bedford County, Pennsylvania, T. H. KNEPP (*Pa. Acad. Sci. Proc., 18 (1944), pp. 29–32*).

Floral survey of the Camp Nawakwa region, Adams County, Pennsylvania, T. H. KNEPP and W. S. NEWCOMER. (Cornell Univ. et al.). (*Pa. Acad. Sci. Proc., 17 (1943), pp. 37–41*).—A preliminary report, including listings of bryophytes, pteriodophytes, and spermatophytes.

The vegetation of Round Island (Straits of Mackinac), Michigan, J. E. POTZGER (*Butler Univ. Bot. Studies, 6 (1944), Papers 9–14, pp. 116–122*).—Data from an ecological survey of the forest on Round Island are presented.

Inoculación de las semillas de leguminosas con bacterias radicícolas (Rhizobium leguminosarum Frank)—primera communicación, J. MARCILLA ARRAZOLA, J. AQUIRRE ANDRÉS, and J. M. XANDRI TAGÜEÑA ([*Spain*] *Bol. Inst. Nac. Invest. Agron. No. 10 (1944), pp. 1–56; Fr., Eng., Ger. abs., pp. 53–55*).—The authors present an annotated listing according to the "American system" of the species of plants for which each species of *Rhizobium* has been considered specific (E. S. R., 68, p. 755), and follow with details and results of inoculation tests on soybean and chickpea.

Pyrimidine nucleosides and nucleotides as growth factors for mutant strains of Neurospora, H. S. LORING and J. G. PIERCE (*Jour. Biol. Chem., 153 (1944), No. 1, pp. 61–69, illus. 2*).—It is shown that when the pyrimidine compounds in yeast ribonucleic acid were used as supplements for two experimentally produced mutant strains of *Neurospora,* normal mycelial growth and conidial production resulted. The nucleosides—uridine and cystidine—and the nucleotides—uridylic and cytidylic acids—were 10–60 times as active as the free pyrimidines—uracil or orotic acid. Cytosine and thymine were inactive for one strain but provided for some growth in the other. The difference in availability of the free pyrimidines for growth of these two mutants, the production of a heterocaryon when they were allowed to fuse, and the types of segregations obtained after crosses with the normal wild type are believed consistent with the theory that pyrimidine synthesis in these fungi involve several reactions, each of which is controlled by a single gene. There are 20 references.

Contribución al estudio de una levadura perteneciente al género Saccharomycodes, capaz de fermentar mostos de una fuertemente sulfitados (mostos azufrados) sin previa desulfitación [Contribution to the study of a yeast of the genus Saccharomycodes capable of fermenting musts of strongly sulfited grapes (sulfured musts) without previous desulfitation], J. MARCILLA ARRAZOLA and E. FEDUCHY MARIÑO (*[Spain] Bol. Inst. Nac. Invest, Agron. No. 10 (1944), pp. 293–296*).

A comparative study of the development of amylases in germinating cereals, E. KNEEN. (Nebr. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 4, pp. 304–314*).—Beta-amylase was found in relatively large amounts in ungerminated barley, wheat, and rye and in much less quantity in oats; the method used was not sensitive enough to detect it in ungerminated corn, sorghum, or rice. Of the total (papain-extractable) amylase, one-third to one-half was readily extracted by a dilute calcium acetate solution. All the ungerminated samples had α-amylase activity, but in relatively minor degree. Germination of the cereals in all cases led to a pronounced increase in α-amylase activity. The β-amylase of barley, wheat, and rye became more readily extractable; its activity in germinated rice, though low, could be evaluated, but the levels in germinated oats, corn, and sorghum were below the sensitivity of the customary methods. The small quantity of β-amylase in oats largely disappeared during germination. When "absolute" changes in amylase activities were calculated for all the samples, it became apparent that with barley, wheat, and rye, a marked loss of β-amylase occurred during germination. Temperatures normally considered desirable for malting wheat inhibited sorghum germination; the significance of this relationship in a comparison of amylase development during germination of different cereals is pointed out. Industrially, the availability of cereal preparations having almost any desired combination of α- and β-amylase may have some significance; e. g., a malt with high α-amylase activity and practical freedom from β-amylase could be prepared from sorghum and one with both α- and β-amylase from barley; the ungerminated barley itself provides a source of β-amylase relatively free of the α form. There are 21 references.

Age variations in the colloid-chemical properties of protoplasm of vegetable cells.—II, Variations in permeability and viscosity in the leaf cells of broadbeans and oats, N. A. MAXIMOV and L. V. MOZHAEVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 6, pp. 277–280*).—In these experiments with oats and *Vicia faba* the ageing process in the cells was characterized first by a reduction and later by an increase in protoplasmic permeability and by an irreversible increase in viscosity. Preceding the formation of new organs (leaves in this study) there was a sharply pronounced rejuvenation of the protoplasm, its permeability and viscosity both being restored to the levels attained by preceding organs at initiation of development. Similar age variations were found between the younger and older parts of single oats leaves. These results agree well with the cyclic theory of ageing and rejuvenation during ontogeny which had been advanced on a morphological basis. These findings with leaves of oats and broadbean confirmed the author's previous results with onion scales and the leaves of cabbage heads. The mechanisms and physiological implications are briefly discussed.

O desenvolvimento da espiga nas primeiras idades, como processo de distinção de formas de inverno e formas e primavera, na cevada [Earliest stages in the development of the barley spike in winter and summer varieties], J. MARQUES DE ALMEIDA (*Agron. Lusitana, 4 (1942), No. 3, pp. 223–230, illus. 1; Ger. abs., p. 229*).—The author investigated the influence of temperature on the germination behavior of barley as exhibited in the earliest developmental stages of the spike, using two winter and two summer varieties. Immediately after a 15-day germination the experimental plants were exposed to a temperature of 1° C., whereupon observations of the growing point and rudimentary spike revealed that an acceleration of development followed such treatment in the winter varieties, whereas the reverse behavior resulted in the summer varieties. The winter and summer varieties of barley can thus be easily distinguished and handled accordingly.

A consideration of the factors controlling the opening of buds in the cacao tree (Theobroma cacao), E. C. HUMPHRIES (*Ann. Bot. [London], n. ser., 8 (1944), No. 30–31, pp. 259–267, illus. 3*).—Factors influencing the breaking of the rest period (flushing) of buds were investigated over a 2-yr. period. A close relationship of flushing frequency with maximum shade temperatures was found, but none with minimum temperatures, day length, hours of sunshine per day, soil moisture or temperature, or rainfall. The minimum resting period for a cacao bud proved to be about 7 weeks.

The scope, technique, and interpretation of the results of experiments on absorption of salts by storage tissue: A reply to criticism, W. STILES and A. D. SKELDING (*Ann. Bot. [London], n. ser., 8 (1944), No. 30–31, pp. 149–156*).—This is a reply to a recent criticism, by Steward and Berry (E. S. R., 90, p. 601), of certain statements in a paper on salt absorption by plant cells, by the present authors (E. S. R., 83, p. 748).

Investigations on the salt resistance of cotton [trans. title], V. A. NOVIKOV (*Izv. Akad. Nauk S. S. S. R. (Bul. Acad. Sci. U. R. S. S.), Ser. Biol., 1943, No. 6, pp. 307–331, illus. 9; Russ. text; Eng. abs., pp. 330–331*).—Cotton plants grown on saline soil became more succulent with increases in salinity of the soil; the initiation of budding and flowering was not perceptibly affected, though increases in salinity were followed by a marked dropping off of the buds and bolls. As the yields decreased with increases in osmotic concentrations of the soil solution, the salt contents of the plants increased in almost direct relation thereto. Increases in the dropping of the buds and bolls with soil salinity were correlated directly with accumulations of salts in these organs and in the leaves. The numbers of buds and bolls formed and the size of the latter decreased with the salinity. Salt resistance differed with the developmental stages; when cotton is grown in saline soils there should not be an excess of salts at the time the seeds are germinating. The salt resistance was tested for 50 varieties belonging to *Gossypium hirsutum, G. herbaceum, G. neglectum*, and *G. barbadense*, a variety of the last exhibiting exceptional resistance. Of the 8 Asiatic cottons tested, 7 proved very resistant; of the 4 Indian cottons, 1; of the 37 American cottons, 7. The sensitivity of cotton during germination is due to the fact that germinating seeds have a low osmotic activity; mature plants readily withstood a salinity of as much as 0.5–1 percent of the dry constituents of the soil. Varieties most resistant during germination also proved most so in other developmental stages. Salt-resistant varieties possessed a high suction force and a low ability to absorb salts. Boric acid lowered the absorption of salts; by moistening seeds in a 0.4–0.7 percent solution of boric acid their salt resistance was increased.

Nitrogenous food as a factor increasing the rate of flowering and fruiting in plants, M. C. ČAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 2, pp. 75–79, illus. 2*).—In sand-nutrient solution cultures, a diet rich in nitrogen inhibited flowering and fruiting in mustard and oats, speeded them up in perilla, millet, lupine, and lettuce, and had no apparent influence on the rate of these processes in buckwheat, soybean, and hemp. It is thus concluded that—contrary to the generally adopted idea that an increase in the N supply prevents all plants from entering the flowering and fruiting phase—there are a number for which N should be considered stimulatory to these processes. With respect to photoperiod, a diet rich in N stimulated the growth of long-day plants (lupine, lettuce), but failed to affect the development not only of day-neutral but also of short-day (soybean, hemp) plants. A simultaneous response of plants to light conditions as well as to their nutrients—particularly N—is believed a more complicated phenomenon, requiring further experimental analysis.

Contribuciones al estudio de plantas medicinales productoras de alcaloides [Contributions to the study of drug plants yielding alkaloids], M. MADUEÑO BOX (*[Spain] Bol. Inst. Nac. Invest. Agron. No. 10 (1944), pp. 137–176; Fr., Eng., Ger. abs., pp. 172–173*).—Following a listing of numerous plant species yielding alkaloids, the author presents details of his comparative study of *Atropa belladona* and *A. baetica.* The latter gave a less satisfactory alkaloid yield than the former but was easier to transplant, though having a lower germinability. The actual amount of alkaloid produced by *A. baetica* was slightly greater but that from *A. belladona* was more potent. Various tests indicated that both quality and quantity of the leaves of *Datura stramonium* are increased by irrigation, elimination of the flowers, and addition of $(NH_4)_2SO_4$ to the soil.

Catalysts of activity of isolated chloroplasts, E. A. BOYCHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 8, pp. 345–347*).—On the basis of experiments with isolated chloroplasts of white clover, it is considered that the active forms of reducing sugars are catalysts of photosynthesis in green plants.

Le chondriome végétal et son évolution, A. GONÇALVES DA CUNHA (*Brotéria, 13 (1944), No. 2–3, pp. 49–72*).—This is a comprehensive review of investigations on the chondriome (over five pages of references).

Variações cromosómicas estruturais induzidas pela centrifugação [Structural variations in chromosomes induced by centrifuging], A. CAMARA (*Agron. Lusitana, 4 (1942), No. 3, pp. 199–211, illus. 8; Eng. abs., p. 210*).—When mitotic chromosomes of *Triticum monococcum vulgare* were subjected to centrifuging, structural variations in the chromosomes followed. The numbers of breaks were highest during the first 12 hr. after treatment, after which they decreased sharply. The existence of zones of higher susceptibility to breaking due to centrifuging was not demonstrated. Fusing of chromosomes did not follow immediately on production of the breaks.

The cytology of Salix in relation to its taxonomy, J. WILKINSON (*Ann. Bot. [London], n. ser., 8 (1944), No. 30–31, pp. 269–284, illus. 26*).—The chief object of this study was to gather further information on the karyology of the willows and to discover in how far this elucidates the phylogeny of the genus. Several new chromosome numbers are recorded on both base numbers (19 and 22). Further instances were discovered of polyploidy within the species unaccompanied by systematic differences. Certain small but critical differences were detected between the chromosome complements of synandrous willows and those of other groups;

these involved satellite number and number of chromosomes with secondary constrictions. The cytological evidence supported the view held by workers in other fields that the Synandrae are the most recent of the willows. Nucleolar number failed to correspond with degree of polyploidy in the Salices. Differential and neutral amphiplasty occurred in first-generation hybrids of *Salix*. The extent to which neutral amphiplasty is manifest apparently depends on the degree of separation of the species on a widely accepted systematic scheme such as that of Andersson. Amphiplastic effects appear not to be transmitted to the second hybrid generation.

Nota sôbre o número de cromosomas da "Betula celtiberica" Rothm. et Vasc. [Note on the number of chromosomes of B. celtiberica], D. DE CASTRO (*Brotéria, 13 (1944), No. 2–3, pp. 73–74, illus. 1*).

Elementos para o estudo citológico do género Lupinus [Cytological study of the genus Lupinus], N. MALHEIROS (*Agron. Lusitana, 4 (1942), No. 3, pp. 231–236, illus. 6; Eng. abs., p. 236*).—The author's chromosome counts in *Lupinus* spp. are compared with data from other investigators (five references).

A method for recording and analyzing variations of internode pattern, E. ANDERSON (*Ann. Missouri Bot. Gard., 31 (1944), No. 3, pp. 241–247, illus. 5*).—Systematists who are at the same time good field naturalists commonly recognize closely related plant species, even at a distance, through their peculiarities of habit, which are often more reliable than any single characteristic; habit, however, is difficult to convey to others or to phrase concisely for keys or technical descriptions. It is based on the size, shape, positions, and textures of leaves and on the internode patterns of the vegetative shoot and inflorescence. This paper offers means for analyzing variation in the internode patterns.

Sôbre o desenvolvimento de exostoses e a emissão de raízes nos caules das plantas novas de Olea europaea L. [The development of exostoses and adventitious roots on the stems of young olive trees], A. RODRIGUES and F. JOSÉ DE ALMEIDA (*Agron. Lusitana, 4 (1942), No. 3, pp. 237–265, illus. 20; Eng. abs., pp. 262–263*).—This paper deals with an investigation of the primary and secondary structures of olive branches undertaken to elucidate the origin of swellings on the roots and stems of olive trees; the results are discussed and illustrated in some detail in comparison with similar phenomena in other plants. The same causes leading to increased growth and production of adventitious buds and exostoses at the nodes close to the leaves were also found to favor differentiation of roots under favorable environal conditions. In young stems the roots arose either almost always at the node, close to the leaf and branch gaps and from the cambium connected with the more highly developed medullary rays, or on a plane at right angles to that of the opposite leaves and from medullary rays between two groups of vessels belonging to the vascular bundle of the upper leaf. When woody stems were earthed up under favorable moisture conditions, roots arose from the excrescences and also through the lenticels along the branch. On the older branches the differentiation of roots occurs only from the excrescences or the cordlike growths which have intense cambial activity.

Experimentos sobre partenocarpia.—I, Solanáceas y Cucurbitáceas [Experiments on parthenocarpy.—I, Solanaceae and Cucurbitaceae], L. M. RUSSEK (*Ciencia [Mexico], 5 (1944), No. 1–3, pp. 34–36, illus. 2*).

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Study of fine chromosome structure under enzyme treatment, S. L. FROLOVA (*Jour. Hered., 35 (1944), No. 8, pp. 235–246, illus. 6*).—A discussion of the literature (19 references) and of the results of the author's studies of chromosome structure and chemistry in both plant (*Vicia faba*) and animal (*Drosophila, Chironomus*, grasshopper) fields. Nuclease and pepsin were the enzymes used in treating th chromosome material.

The antipodals in relation to abnormal endosperm behavior in Hordeum jubatum × Secale cereale hybrid seeds, R. A. Brink and D. C. Cooper. (Wis. Expt. Sta.). (*Genetics, 29 (1944), No. 4, pp. 391–406, illus. 12*).—Abnormal chromosome distribution characteristic of hybrid endosperm in *H. jubatum* × *S. cereale* seeds was shown to be associated with a radically altered behavior of antipodals which are prominently developed in the female gametophyte in a position athwart the nutrient stream. Their cells and nuclei are normally stimulated to a marked hypertrophy at fertilization. Antipodals appear to function in secretion of substances necessary for endosperm growth up to about 28 hr., after which they decline rapidly. Measurements of volume show that *S. cereale* sperm, on entering the *H. jubatum* embryo sac, exert only a feeble stimulus on antipodals. Cytoplasm remains dense, and only a limited and irregular enlargement of nuclei occurs. The triple fusion hybrid nucleus nevertheless enters upon division promptly, and early endosperm development proceeds in association with the weakly functioning antipodals.

The hybrid endosperm nuclei under these conditions may fail to receive through antipodals all materials needed for growth and reproduction, and starvation is reflected in gross mitotic disturbances eventually so impairing the endosperm that its development is arrested and the entire seed breaks down. Time relations between stimulation of antipodals and division of the primary nucleus (often abnormal) are such that the latter event could be conditioned by subnormal secretory activity of antipodal tissue. Confirmation of this explanation of collapse in *H. jubatum* × *S. cereale* seeds was noted in a similar sequence of changes leading to early seed failure following fertilization of common barley (*H. vulgare*) by rye.

Character, field performance, and commercial production of waxy corn, T. A. Kiesselbach. (Nebr. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 668–682, illus. 1*).—Field performance tests in eastern Nebraska, 1941–43, were made of several waxy corns having commercial possibilities in comparison with Iowa 939 and U. S. 13 standard Corn Belt hybrids and Reid Yellow Dent. Iowax 1 (formerly Waxy Iowa 939) proved most productive and possessed superior vegetative characteristics, 1942–43. Iowax 1 averaged about 4 percent less than Iowa 939 and 15 percent less U. S. 13 and might be grown to advantage where Iowa 939 is grown extensively because of special adaptation. Promiscuous production of waxy corn and its admixture with nonwaxy corn evidently should be avoided, best through strict contract production involving isolation from other corn.

In plats subject to extensive outcrossing with unrelated pollen of both waxy and nonwaxy corn, outcrossed nonwaxy kernels of Nebraska Waxy and Iowax 1 were 3.9 and 2.8 percent heavier, respectively, than waxy kernels on the same ears. Significant differences were not found in yield per acre from white and yellow waxy segregates, or waxy and nonwaxy segregates, or in seedling emergence or vegetative habits. Observation that the waxy character may result in about 3 percent less translocation from stalk to grain suggested that two hybrids, identical in all genes except waxy, would differ about 3 percent in yield of grain per acre, which may account largely for the lower yield of Iowax 1 compared with Iowa 939. Subjecting waxy corn to outcrossing by nonwaxy pollen in variety tests may result in a maximum error of about 3 percent in acre-yield determination, the amount depending upon proportion of outcrossed kernels. Further tests confirmed earlier findings on differential fertilization, there being a deficiency of about 1 percent in total expected number of waxy kernels.

The inheritance of flower fragrance and other characters in rice, N. E. Jodon. (U. S. D. A. coop. La. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No.*

).—Flower fragrance found in C. I. 3794, a rice variety introduced
pines, is characterized by a light but distinct sweet violetlike odor
which is distinct from the odor or flavor of scented rice and ap-
occur in the grain. In the crosses C. I. 3794 × Fortuna and C. I.
agrance apparently is inherited as a single factor dominant, inde-
pubescence, straw color, Cerospora resistance, purple color of inner
ues, purple color of outer glumes, and maturity. The latter characters were also inherited independently of one another.

The inheritance of reaction of Turkey-Florence-1 × Oro-1 to race 11 of Tilletia tritici, O. A. VOGEL, C. E. CLASSEN, and E. F. GAINES. (Wash. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 473–479*). —Three crosses, consisting of the three possible combinations of Oro-1, Turkey-Florence-1, and Sel. 9 of Oro × Turkey-Florence, were studied for the inheritance of reaction to this race of the bunt fungus. The F_1, F_2, and F_3 of all 3 crosses and 6 randomly selected F_4 families of Turkey-Florence-1 × Oro-1 were tested for reaction during 1940 under identical environal conditions; 5 additional F_4 families were tested in 1941. At least three factors, two major and one minor, appeared to account for the segregation of reaction in Turkey-Florence-1 × Oro-1. Oro-1, the most resistant parent, carried the two major dominant factors; Turkey-Florence-1 carried the minor dominant factor for resistance. Segregation of the crosses of Sel. 9 with Oro-1 and Turkey-Florence-1 indicated that Sel. 9 carries one of the two major factors of Oro-1 and the minor factor of Turkey-Florence-1. Three of the 11 randomly chosen F_4 families appeared to have come from homozygous genotypes; one like Oro-1, the other like Turkey-Florence-1, and the third appeared to have all three factors of the two parents. Each of 7 F_4 families appeared to have come from a different heterozygous genotype—one segregating for three factors, three for two factors, and three for one factor. One F_4 family appeared to have come either from a genotype segregating from one factor or from a mixture of two genotypes, each segregating for one factor. The presence of the new race, T-13, in the T-11 inoculum did not appear to alter the so-called T-11 reactions sufficiently to be noticeable.

Production of amphidiploids of Triticum orientale × Triticum timopheevi by colchicine treatment, A. R. ZHEBRAK (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 8, pp. 352–354, illus. 1*).

Variation and inheritance of certain characters of brome grass, Bromus inermis Leyss, Y. S. TSIANG. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 6, pp. 508–522*).—Highly significant differences in reaction to leaf spot (*Selenophoma bromigena*) were found between clonal lines of bromegrass and also between their 1-yr.-selfed progenies; *r* values of +0.63 and +0.66 were obtained for reaction to leaf spot of 1-yr.-selfed progenies and their parental clonal lines with the Parkland and creeping types, respectively. Many 1-yr.-selfed lines proved superior in leaf spot resistance to the commercial variety of their respective type. Significant differences with few exceptions were found within each group for all the characters studied. A number of selfed lines equaled or surpassed the commercial variety for each character. Yield of hay, basal diameter, vigor of recovery, and leaf width were found to be inherited, as selfed progenies were highly correlated with their parental clonal lines. Differences for heat and drought resistance were found among clonal lines of both types and also among their selfed progenies. Heritable variations in β carotene content were found in creeping bromegrass as indicated by an *r* value of +0.76 obtained for parental clonal lines and selfed progenies. Significant differences were found for contents of Mg and K between 36 clonal lines. Interrelationships of plant characters were studied with clonal lines of both types of bromegrass, and important relationships were summarized. Treatment of panicles with hot water at either 47° C. for 3 min. or 48° for 1 min. was a relatively satisfactory method of bulk emasculation.

Hybrids between Napier grass and cattail millet, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Hered., 35 (1944), No. 8, pp. 226–232, illus. 5*).—Of 134 F_1 of Napier grass (*Pennisetum purpureum*) × cattail millet (*P. glaucum*) grown to maturity, 49 were chlorophyll deficient, about one-tenth the size of the green hybrids, and produced heads with a very high percentage of sterile florets. The green hybrids resembled Napier grass, and many outyielded it materially. Eight green hybrids branched more profusely at the nodes than Napier grass and others, like cattail millet, branched very little. Heads of green hybrids produced stigmas and shriveled anthers failing to dehisce and shed pollen. All hybrids were highly sterile. Forty percent of the hybrids, including practically all of the yellow ones, were killed by a minimum temperature of 15° F. Most surviving hybrids were less vigorous early in the spring and produced fewer shoots than Napier grass, evidence of winter injury. Cytological examination of root tips of several hybrids revealed that all possessed 21 somatic chromosomes, the combined reduced numbers of the two parents. Identity of the Napier ($2n=28$) and cattail millet ($2n=14$) chromosomes in the equatorial plates of the hybrids was readily established. Five of the best hybrids, apparently of considerable economic value, were sent to several tropical countries for evaluation.

Analysis of variation in Panicum virgatum, E. L. NIELSEN. (Ark. and Wis. Expt. Stas. and U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 8, pp. 327–353, illus. 12*).—Chromosome numbers were determined in 59 races of switchgrass (*P. virgatum*) derived from seed and clonal stocks taken from a wide area, mainly in the Great Plains. A polyploid series of 18, 36, 54, 72, 90, and 108 somatic chromosomes was shown. No regional segregation of races of the species upon the basis of chromosome number was apparent.

Of the 59 races, 28 were compared statistically for 15 quantitative characters. In 7,328 comparisons between characters of all races of different chromosome numbers, 66.3 percent indicated differences exceeding the 1-percent level of significance to occur between those characters, while the 1,175 comparisons between characters of isolates of the same chromosome number indicated that 58.6 percent of the characters differed to a highly significant degree. When diploid, tetaploid, octoploid, and decaploid races from Chippewa Falls, Wis., were considered separately in the same manner, 61.7 percent of 412 comparisons among races of different chromosome numbers differed by a significant amount, and 53.7 percent of 54 comparisons between races of the same chromosome number differed significantly.

A significant positive regression was ascertained between aerial vegetative organs and plant height, but there was no relationship between plant height and lengths of spikelets and caryopses, length of internodes and diameters of nodes of rhizomes, or diameters of nuclei of root tips. Length of panicle was significantly related with its lowermost branch, but not significantly with lengths of spikelets and caryopses. Normal frequency distribution curves, calculated for each of 15 characters in four races of different chromosome complexes, and placed upon a common base line representing 100 percent of variation in that particular character, indicated that wide differences separate certain lines for some characters, whereas for other characters they overlap or may be entirely inseparable. Alternative procedures usable in systematic consideration of races of grass species are considered.

The genetics of blackarm resistance.—IV, Gossypium punctatum (Sch. & Thon.) crosses, R. L. KNIGHT (*Jour. Genet., 46 (1944), No. 1, pp. 1–27, illus. 9*).—Preceding contributions have described a technic for infecting cotton plants with *Bacterium malvacearum* and a system of grading blackarm resistance and shown that resistance of the American Upland strain Uganda B 31 is due to two dominant cumulative factors, B_1 and B_2;[1] and have classified 160 varieties and strains of cotton on the basis of blackarm resistance and described the type of resistance inheritance obtaining in certain American crosses.[2] In the present installment it is shown that BAR 3—a strain of *G. punctatum* showing grade 1–2 resistance (0 = immunity and 12 full susceptibility)—contains two linked blackarm resistance genes B_2 and B_3, B_2 being the gene for resistance in *hirsutum* varieties and B_3 a new semidominant factor conferring grade 7.1–8.1 resistance on Sakel (*G. barbadense*) when heterozygous and grade 4.1–7.1 when homozygous. Neither minor nor modifying factors in BAR 3 are sufficiently strong to have any marked effect. B_2 and B_3 are additive, $B_2b_2B_3b_3$ and $B_2B_2B_3b_3$ plants showed resistance of about grade 4. $B_2b_2B_3B_3$ and $B_2B_2B_3B_3$ plants showed grade 3 resistance when the factors were transferred to a Sakel genotype. B_3 and B_1 (the latter derived from Uganda B 31) also showed marked additive effect, $B_1B_1B_3b_3$ and $B_1b_1B_3b_3$ Sakel plants possessing grade 4–6 resistance.

Factors B_2 and B_3 are linked and showed 32.4 percent cross-overs in the first four backcrosses, with a resistant : susceptible ratio of 1.96 : 1 against a 3 : 1 dihybrid expectation. The straight F_2 and F_2 of early backcrosses gave good approximation to the 7.8 : 1 ratio expected with 32.4 percent cross-over, except that some families in the straight F_2 showed the repulsion ratio. Later backcrosses and later backcross F_2 showed a loss of linkage attributed to replacement of the *punctatum* segment of chromosome between B_2 and B_3 by *barbadense,* thus permitting greater freedom of crossing over and making the recombination value approach 50 percent. The resistance of Gambia Native, another *punctatum* strain, is also due to B_2 and B_3, but Gambia possesses, in addition, a number of minor factors, and crosses between Gambia and Sakel showed blending inheritance in F_2. Both resistant and susceptible strains of Hindi Weed cotton occur. Resistant selections contained B_2 unaccompanied by weak factors; B_2 in the Hindi genotype produced a slightly heightened resistance attributed to modifying factors. Darfur Local, a cultivated *punctatum* from the western Sudan, was heterogeneous for resistance but gave evidence of the presence of B_3 and, assumedly, also of B_2. Kadugli Local, a semiwild *punctatum* from Sudan, showed marked (grade 4) resistance, but no genetical analysis has yet been made.

De mogelijkheid van de kruising Solanum tuberosum ♀ × S. chacoense ♂, C. Kapenga (*Genetica* [*'s Gravenhage*], *23* (*1943*), *No. 5–6, pp. 537–538, illus. 1; Eng., Ger. abs., p. 538*).—Report of a successful cross (1941): *S. tuberosum* ♀ and *S. chacoense* ♂, using the varieties Roode Star and Epicure as mother plants.

A comparison of Sweet Spanish hybrids with commercial Sweet Spanish onion strains, A. M. Binkley and H. A. Jones. (Colo. Expt. Sta. coop. U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44* (*1944*), *pp. 485–487, illus. 1*).—A number of lines have been isolated in both the Utah Sweet Spanish and Colorado No. 6 onions that produce 100 percent male-sterile progenies. The male-sterile lines are being crossed with desirable male-fertile lines to produce desirable hybrids. Comparative yield tests of certain new hybrids and commercial varieties showed most of the hybrids to be in the same yield classes as their commercial parent. One hybrid, No. 153, gave a significantly higher yield. Further improvements are expected when a large number of inbred lines are available for crossing.

Studies in the genetics of the onion (Allium cepa L.), H. A. Jones, A. E. Clarke, and F. J. Stevenson. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44* (*1944*), *pp. 479–484*).—The following recessives observed in onion crosses are described: Albino seedling; yellow seedling, linked with glossy; yellow seedling; not linked with glossy; pale green seedling; virescent seedling; glossy foliage; exposed anther; and yellow anther. The authors suggest that there may be at least two pairs of genes either of which may produce the yellow chlorophyll deficiency, since in some crosses the yellow seedling lethal is linked with glossy, whereas in other crosses it is independent. Pale green is also linked with a yellow lethal.

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[1] Jour. Genet., 38 (1939), No. 1–2, pp. 133–159, illus. 9.
[2] Jour. Genet., 41 (1941), No. 2–3, pp. 391–409, illus. 3.

A male and female sterile variant in squash, Cucurbita maxima, Duchesne, A. E. HUTCHINS. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 494–496, illus. 2*).—The distinguishing features fruiting behaviour and inheritance of a male and female sterile variant as observed in an F_3 line of a cross between inbred lines of Greengold and Banana squashes are discussed. In the F_3 line the variant was readily distinguished in the field by the abnormal appearance of the male blossoms, which had small stiff petals which were ruffled at the tips when closed. Their color when fully opened was whitish-yellow rather than the normal bright yellow. Segregations observed in the F_3 line and in F_4 lines from normal appearing F_3 segregations were such as to indicate that the differences between normal and variant plants were conditioned by a single genic factor.

The inheritance of certain characters in a cross of two American species of Lactuca, T. W. WHITAKER. (U. S. D. A.). (*Bul. Torrey Bot. Club, 71 (1944), No. 4, pp. 347–355, illus. 6*).—Successful crosses were made between *L. canadensis* and *L. graminifolia.* Both of these species of lettuce had 17 pairs of chromosomes. The progeny were as fertile as either parent. Observations on the manner of inheritance of three distinctive characters, pollen color, leaf lobing, and growth habit, showed all to be dependent on single gene differences. The capacity of the two species to maintain themselves as separate entities in nature when their ranges overlap is ascribed to difference in time of blooming.

Inheritance studies of flower color in periwinkle, W. S. FLORY, JR. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 525–526*).—The Madagascar periwinkle is one of the most heat and drought resistant of flowering annuals grown in Texas. Since the comparatively few colors are a definite limitation, a study was made of color inheritance with a view to obtaining genetic information and new forms. The data indicated that two pairs of factors are concerned in flower color, one (designated as *W*) determining pink petal color but capable of expression only in the presence of a second factor *R*, a gene responsible for red eye color. Red pigmentation in the stems is associated with flower color. Red color is present in stems of all pink-flowered plants and also to a lesser extent in all white red-eyed plants. Such pigmentation was not present in stems of white-flowered plants.

Chromosome numbers in Vaccinium and related groups, G. M. DARROW, W. H. CAMP, H. E. FISCHER, and H. DERMEN. (U. S. D. A. et. al.). (*Bul. Torrey Bot. Club, 71 (1944), No. 5, pp. 498–506*).—Early difficulties in crossing certain types of blueberries were traced to differences in chromosome numbers. Microscopic studies showed the *Vaccinium* group to be extremely variable. Morphologically some of the diploid blueberry species are so different that it would almost appear that there was more than one line of descent or at least that divergence began in very early times. The results of the cytological examinations are set forth in tabular form with brief notes as to type of plants, source of material, etc. A list is also presented of all species of cranberry, *Oxycoccus.* The American species *O. macrocarpus* and *O. ovalifolius* have 24 and 48 somatic chromosomes. *O. quadripetalus* collected in Maine had 48 somatic chromosomes. The results of the study should be helpful in breeding studies to develop improved varieties.

A preliminary consideration of the biosystematy of Oxycoccus, W. H. CAMP (*Bul. Torrey Bot. Club, 71 (1944), No. 4, pp. 426–437*).—The cranberry, a group of the Vaccinium family and recognized generally as the genus *Oxycoccus,* occurs as diploids, tetraploids, and hexaploids. There is a southern diploid species, *O. macrocarpus* and a northern diploid species, *O. microcarpus.* There is a third group essentially circumboreal in distribution and known as *O. quadripetalus*. Isolated, sterile hexaploid plants have been observed in Europe, presumably as derivatives from the tetraploid.

Polarized segregation in an ascomycete, D. G. CATCHESIDE (*Ann. Bot. [London], n. ser., 8 (1944), No. 30–31, pp. 119–130, illus. 3*).—In the fungus *Bombardia lunata* there are two mutants—rubiginosa and lactea—which have light-colored transparent ascospores, the normals being dark. Segregation for ascospore color in a cross between light and dark strains is shown directly in the asci, which have an orderly row of eight spores. Zickler's data (E. S. R., 72, p. 751) were reexamined and found to show biased segregation of the mutant genes from their normal allels, such that the normal ones tend to be segregated to the upper spindle poles at the first and second meiotic divisions. The bias at the first division is about 14 percent, that on the second-division lower spindle 7.7 percent, and that on the second-division upper spindle 2.6 percent. There was no evidence as to whether hybridity of the heterochromatic regions of the affected bivalent was responsible for the bias. The bias must depend on a difference—probably a graded one—between the upper and lower regions of the ascus, as well as on a difference between the biased chromosomes.

The cattle of India, R. W. PHILLIPS. (U. S. D. A.). (*Jour. Hered. 35 (1944), No. 9, pp. 273–288, illus. 8*).—A brief discussion is given of the types and breeds of cattle of India. These cattle are listed in six groups, i. e., (1) lyre-horned gray cattle with wide foreheads and prominent orbital arches; (2) short-horned white or light gray cattle with a long coffin-shaped skull; (3) cattle of more ponderous build, with a pendulous dewlap and sheath, usually spotted red and white or brown and white, and referred to as "dairy type"; (4) medium-sized, compact animals, usually gray in color, with long pointed horns; (5) small, short-horned cattle, usually black or some shade of red; and (6) medium-sized, compact, and active animals with small horns and with few black or red spots on a white coat. These are prized as draft animals. There are given brief descriptions of 6, 9, 6, 6, 5, and 1 breeds under the respective groups, with a statement of the territory of origin.

"Compact" Shorthorns, H. H. STONAKER and R. C. TOM. (Colo. Expt. Sta.). (*Jour. Hered., 35 (1944), No. 8, pp. 247–250, illus. 1*).—An extreme degree of compactness of the body and shortness of the legs was observed in three purebred Shorthorn herds, with little difficulty in separation from the standard type at birth. From the ratio of compact to standard calves found in unselected calf crops, it was assumed that the character was due to a single dominant gene which may be similar to the "duck-legged" gene in Hereford cattle reported by Lush (E. S. R., 64, p. 727). In the three herds there were 88 compact and 66 standard calves.

Hereditary strabismus in Jersey cattle, W. M. REGAN, P. W. GREGORY, and S. W. MEAD. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 8, pp. 233–234*).—A sixth hereditary defect in the station Jersey herd (E. S. R., 91, p. 399), involving the occurrence of strabismus at 6 to 12 mo. of age, was brought to light by inbreeding. This cross-eyed condition was not evident in any calves at birth, but occurred in one animal at 6 mo. of age, while all others developing it were 12 mo. old when the anomaly was first observed. Among the male progeny from bulls mated with their own and carrier daughters there were 18 normals, and among the female progeny 41 normals. There were produced at the same time 2 males and 7 females with the cross-eyed condition. An analysis of the data indicated that strabismus was controlled by one autosomal recessive gene.

Quintuple lambs of woolless domestic sheep, D. H. JOHNSON (*Jour. Hered., 35 (1944), No. 8, pp. 251–253, illus. 2*).—A Barbados ewe dropped four apparently normal but stillborn lambs and one partially resorbed and much shrunken. The rarity of such multiple births in sheep is noted, and the markings on these woolless sheep are described.

Some factors affecting the resistance of ejaculated and epididymal spermatozoa of the boar to different environmental conditions, J. F. Lasley and R. Bogart. (Mo. Expt. Sta.). (*Amer. Jour. Physiol., 141 (1944), No. 5, pp. 619–624*).—The resistance and survival of spermatozoa in semen from different portions of the testes of 20 boars was ascertained fresh and after dilution with buffers, accessory secretions, centrifuging, exposing to 0° C. for 10 min., and after removal from different parts of the reproductive tract and storing up to 16 days. The results showed that the secretions from the accessory reproductive glands or diluters did not greatly influence resistance to cold shock or storage facilities. Resistance to cold shock and survival in storage were increased by diluting with egg yolk phosphate buffer. The place of the reproductive tract from which the spermatozoa were obtained influenced the resistance to cold shock.

The effect of artificially-increased length of day on molt, growth, and priming of silver fox pelts, C. F. Bassett, O. P. Pearson, and F. Wilke (*Amer. Fur Breeder, 17 (1944), No. 3, pp. 32–38, illus. 2*).—Little if any influence was noted in early shedding of foxes from extra illumination during April, May, and early June. In late July and early August most of the old fur was lost, but it was not certain whether this was caused by the increased illumination during the spring or the abrupt change to little extra lighting after June 7. The 16 test animals were prime and ready to pelt by November 7, while unlighted control animals did not reach this stage until the week of December 5.

Duration of pregnancy in marten, mink, and related species, O. P. Pearson and R. K. Enders (*Amer. Fur Breeder, 17 (1944), Nos. 1, pp. 24, 26, 28, illus. 1; 2, pp. 26, 28, 30, 42*).—Most species of the weasel family are classified in one of two groups on the basis of the length of the gestation period. The gestation of those of normal length was contrasted with those having a delayed implantation, as in case of the marten and mink. By supplying additional lighting to lengthen the days after mating, the gestation period of the marten was shortened 3–4 mo. Unimplanted blastocysts were found in mink 20 days after mating, and periods of delay longer than this evidently occur. Implantation was probably less than 31 days. The gestation period of the mink was shortened by an average of about 3 days by increasing the length of daylight.

Early history and mechanics of the chick blastoderm: A review, D. Rudnick (*Quart. Rev. Biol., 19 (1944), No. 3, pp. 187–212, illus. 10*).

Crossbreeding in turkeys.—I, Effect on fertility, hatchability, and viability of poults, T. B. Clark, T. D. Runnels, and E. A. Livesay. (W. Va. Expt. Sta.). (*U. S. Egg and Poultry Mag., 50 (1944), No. 9, pp. 418–420, 430–431*).—The results of 5 years' studies in crossing Bronze, Bourbon Red, and Broad Breasted Bronze males with females of these breeds and Black showed that crossing these breeds is probably as effective for increasing fertility as is crossing in chickens. Crossing breeds with a hatchability above 80 percent lowered the hatchability as often as it increased it. However, crossbreeding increased hatchability significantly, 8.2 percent for fertile eggs and 10.7 percent for total eggs set. Each year 1 or 2 males of each breed were mated with 4–10 hens of the same and different breeds, producing a total of about 600–800 poults each year.

Ovarian stimulation by oestrogens: Effects in immature hypophysectomized rats, P. C. Williams (*Roy. Soc. [London], Proc., Ser. B, 132 (1944), No. 867, pp. 189–199, illus. 4*).—Implantation of stilbestrol will prevent the decrease of ovary size following hypophysectomy. The number of follicles greater than 200μ in diameter was increased, though the size of the largest follicles was unchanged. In the treated rat the follicles were predominantly solid. Atrophy of the interstitial cells was not prevented. When stilbestrol was implanted 17 days after hypophysectomy, only the semimature follicles not yet atrophied were stimulated. Injection of antigonadotropic serum sufficient to neutralize gonadotropin secreted by the pituitary did not interfere with ovarian stimulation as produced by estrogen. The daily absorption of about 120 µg. of stilbestrol tablets produced effects similar to those with 100 µg. of estrone. Daily injections of 12.5 µg. of estrone produced histologically demonstrable stimulation.

A technique for the simultaneous measurement of semen quality and testis histology in vitamin A studies of the dairy bull, R. E. ERB, F. N. ANDREWS, J. F. BULLARD, and J. H. HILTON. (Ind. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 9, pp. 769–772, illus. 2*).—Removal of a small section of a testis of a bull for histological study by methods previously described (E. S. R., 88, p. 614), after being 4 mo. on a vitamin A-deficient ration, showed severe degeneration of the seminiferous tubules, no spermatozoa in the semen, and other symptoms of vitamin A deficiency. The histology of the testis improved when the ration was supplemented with cod-liver oil. Evidently the effects of vitamin A deficiency on spermatozoa in the dairy bull may be effectively measured by study of the semen and microscopic anatomy of the spermatogenesis after feeding deficient or adequate rations.

The response of the bovine ovary to pregnant mares' serum and horse pituitary extract, S. J. FOLLEY and F. H. MALPRESS (*Roy. Soc. [London], Proc., Ser. B, 132 (1944), No. 867, pp. 164–188, illus. 14*).—Qualitative and quantitative responses in the ovaries of 70 cows and 151 heifers to single subcutaneous injection of pregnant mare serum and horse pituitary extract were investigated. The threshold dose of pregnant mare serum for quantitative effects was 1,000 to 2,000 International Units, and for larger doses a greater response with the maximum reached with 3,000 to 4,000 I. U. There was no correlation between the number of follicles produced and the stage of the estrous cycle at which the injection was given. Qualitative changes included multiple ovulation, anovulatory luteinization, the formation of abnormally small corpora lutea (with pregnant mare serum only), and hemorrhagic follicles. The rupture of a single follicle within 1 to 2 days of treatment was caused by horse pituitary injections at all stages of the cycle. It was only when injection was given at the last or follicular phase of the cycle that ovulation followed treatment with pregnant mare serum alone. Histological sections of selected ovaries from these tests are illustrated.

FIELD CROPS

Efficiency of design in field experiment at Potchefstroom, South Africa, A. R. SAUNDERS (*Empire Jour. Expt. Agr., 12 (1944), No. 47, pp. 157–162*).—Efficiencies of lattice, balanced-lattice, lattice-square, balanced incomplete-block, and split-plat designs were compared in experiments with several field crops (E. S. R., 90, p. 176). Lattice designs gave an average increase in efficiency of 29 percent, balanced lattices 52, lattice squares 134, and balanced incomplete blocks 37 percent with recovery of interblock information. Split-plat arrangements resulted in a considerable loss of information on main-plat comparisons and an appreciable gain on subplat comparisons.

Estimating individual forage plant yields, G. W. BURTON. (U. S. D. A. coop. Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 709–712*).—Ratings on strains of Dallis and Bahia grasses by individuals suggested that where a reasonably precise yield rating of individual plants is desired several repetitions of ratings made for any particular planting will probably be necessary. Where the main emphasis is upon the mean yield rating of a strain represented by a number of plants, one rating may be adequate.

Effect of the use of winter legumes on yields of cotton, corn, and rice, M. Nelson (*Arkansas Sta. Bul. 451 (1944), pp. 32, illus. 1*).—That fall-seeded green manures, especially adapted legumes, turned under in the spring, increased yields of following crops of cotton, corn, and rice, was determined in experiments, 1932–41, with cotton and corn at the Cotton Branch Station and with rice, 1932–40, at the Rice Branch Station. The green manures were turned under at 2-week intervals for three successive periods to determine the effects of time of turning on rice yields.

Hairy vetch and crimson clover gave most consistent production of organic matter and added large amounts of N to the soil. Austrian winter peas did not produce as consistently although producing large average crops of organic matter. Bur-clover and red clover also made large average amounts of organic matter when grown for cotton and corn, but amounts produced fluctuated greatly from year to year. Neither bur-clover nor white sweetclover appeared adapted to conditions in rice soils. Alfalfa, white sweetclover, and yellow trefoil did not seem to be adapted to conditions in the cotton and corn experiments. Large increases in cotton and corn resulted when large amounts of legumes were turned under, hairy vetch and crimson clover giving the more consistent performance. The average increase in yield of seed cotton after winter oats turned under was only about one-third of that following adapted legumes. Increase in corn yield after oats was not significant. Hairy vetch, crimson clover, and Austrian winter peas as green manures resulted in significantly higher yields of rice at early, medium, and late dates of turning under, largest increases in yield coming from hairy vetch turned under at the medium date. Large quantities of rye plowed under had slight effect on rice yields. Neither small increases in average yields nor a small decrease resulting after turning rye under late was significant. Value of winter legumes as green manures followed by cotton, corn, and rice appeared associated with the amount of N added to the soil. Estimates were that 30 to 50 percent of average yields of cotton and corn resulted from turning under organic matter containing N.

Crop rotations in the Prairie Provinces, E. S. Hopkins and A. Leahey (*Canada Dept. Agr., Farmers' Bul. 124 (1944), pp. 70, illus. 18*).—Results of crop rotation experiments on Dominion Experimental Farms in Manitoba, Saskatchewan, and Alberta, conducted since 1911, are reported with remarks on the merits of different sequences, effects on weed control, effects of fertilizers, manures, and green manures, influence of season on crop yields, and effects of cultivation and cropping on the N content of prairie soils.

Summer fallow in Nebraska, L. L. Zook and H. E. Weakley. (Coop. U. S. D. A.). (*Nebraska Sta. Bul. 362 (1944), pp. 28, illus. 16*).—Higher average acre yields of all crops, 1912–41 (1935–36 omitted), were produced on summer-fallowed land than by any method of annual cropping, although increases enough to compensate for loss of land during the fallow year were usually obtained only in seasons of subnormal rainfall. In years of above-normal rainfall (April-August previous to seeding winter wheat, deemed a useful guide for adjusting relative acreages of wheat and summer fallow), average production from continuously cropped land, early fall-plowed, was 13.6 bu. more wheat than from alternate cropping and summer fallow, and for years of subnormal rainfall for this period, 3.2 bu. less. Similar results were obtained at Hays, Kans. (E. S. R., 75, p. 338). Total average production of winter wheat from alternate fallow was 3.8 bu. more per acre than from continuous cropping on late plowing but 5.2 bu. less on early plowing. Each additional bushel of winter wheat on summer fallow was matched by 1.75 bu. of corn from the rotation of corn and winter wheat. Spring grains generally made less favorable gains than winter wheat on summer fallow. Corn has not been satisfactory in general on summer-fallowed land. Good yield increases occurred in a few very dry years, but through a period, alternate fallow and corn produced 34 percent less than continuous corn. In comparison with corn—small grain rotations, each bushel of corn gained by alternate fallow and corn was replaced by 2.7 bu. of winter wheat, spring wheat 1.9 bu., oats 4.8 bu., or barley 3.1 bu. Potatoes on fallowed ground generally produced gains of equal or larger value than grain or corn would have made on the land instead of fallowing. Summer fallow has provided good insurance against failure or unprofitable yields of forage sorgo.

Distribution and expansion of summer fallow in Nebraska, moisture storage on summer-fallowed land, adjusting cropped and summer-fallowed acreages by rainfall in the previous season, and tillage methods and implements for summer fallow are also discussed. At North Platte, the average proportion of the rainfall represented in increased storage on a 6-ft. soil section under summer fallow, 1912–41, was 26.3 percent (range 8.5 to 41.7 percent). Over 15-yr., summer-fallow land untilled until June contained 60 percent less moisture in the fall than land kept free of weeds for the entire fallow period, and only 15 percent more moisture than land in corn.

A study of factors affecting the growth of lawn grasses, W. S. Lapp (*Pa. Acad. Sci. Proc., 17 (1943), pp. 117–148, illus. 10*).—Growth of turf grasses was studied, 1938–42, in experiments at the University of Pennsylvania and on turf elsewhere. From August 15 to October 15 was the most dependable time for seeding new lawns in the section. On fertile soil in the sun 3 lb. of a seed mixture mainly of perennial species has sufficed for 1,000 sq. ft. but in the shade 5 lb. should be sown. The mixture producing the best turf comprised Kentucky bluegrass 55 percent, Chewings fescue 20, meadow fescue 15, Colonial bent 7.5, wild white clover 2.5 percent. Its outstanding performance was attributed largely to wild white clover. A mixture containing Kentucky bluegrass 40 percent, Colonial bent 20, and Chewings fescue 40 percent also produced excellent turf. Formulas recommended by the Pennsylvania and New Jersey Experiment Stations for shady lawns were satisfactory, provided shade was not too dense. All formulas recommended by the two stations were distinctly superior to commercial mixtures tested. An observation on the 20 mixtures studied was that turf quality was higher and colonizing ability stronger as the percentage of perennial species was larger. Species producing the best turf in pure stands 1939–41 in order of colonizing ability were Colonial bent, Kentucky bluegrass, and Chewings fescue.

High cutting, 1.5 to 2 in., has improved ordinary turf by encouraging deeper rooting, which gives the grass better drought resistance and also discourages weeds, and frequency of mowing can be reduced. Kentucky bluegrass and clover have grown best in soils about neutral (pH 6.0–8.0), and bristle fescues and bents best in acid soils (pH 5.0–6.0). Shady lawns should be limed only when a soil test reveals a Ca deficiency, and then only lightly. Starter solution (2.5 lb. of 13–26–13 fertilizer in 20 gal. water per 1,000 sq. ft.) applied monthly was helpful in carrying spring seedlings through the first summer. NP fertilizer produced a higher yield than NPK fertilizer. One-half ton of humus per 1,000 sq. ft., thoroughly and uniformly mixed with the soil to a 6-in. depth, produced denser, more resilient, and more durable turf. Humus substitutes such as drug waste (cascara and hemlock bark) seemed toxic and not to be used on turf.

Hormone treatment of grass seed stimulated growth of both roots and shoots, whenever the auxin was used at or near optimal concentration. High concentrations alone inhibited growth, but when used together with fertilizer (or nutrient), growth was stimulated. All of the hormones used at different times in the study stimulated growth. The stimulation produced by the double treatment of fertilizer and hormone at optimal concentration appeared to be the sum of the stimulations produced by these two factors acting separately.

The influence of lespedeza and fertilizer treatment on the behavior of Dallis grass, carpet grass, and Bermuda grass, R. L. LOVVORN. (N. C. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 10, pp. 791–802, illus. 6*).—Seedings of Dallis, carpet, and Bermuda grasses, alone and in combination with Kobe lespedeza, established in the spring of 1937 on Norfolk fine sandy loam soil under six fertilizer treatments, were studied 1937–42. Dallis grass and lespedeza mixture outyielded other seedings when commercial N was applied, although Bermuda grass-lespedeza produced as much herbage on unfertilized plats. Mixtures of each grass and lespedeza outyielded the grasses alone. Bermuda grass, with and without lespedeza, produced more herbage than corresponding seedings of Dallis grass from April through June. The grasses were stimulated by heavy N applications, the resulting increase in competition reducing the stand of lespedeza. Mineral fertilizer exclusive of N had little effect on density of grasses except where winter-killing occurred. Fertilizers and presence of lespedeza decreased the extent of winter-killing of Dallis grass and carpet grass. Bermuda grass did not winter-kill. Density of stands of Dallis grass and Bermuda grass was affected more by complete fertilizer than was the stand of carpet grass. See also an earlier note (E. S. R., 91, p. 674).

A comparison of bromegrass and orchard grass pastures, R. F. FUELLEMAN, W. L. BURLISON, and W. G. KAMMLADE. (Ill. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 10, pp. 849–858, illus. 3*).—Alfalfa, bromegrass, and orchard grass alone and alfalfa with each grass, seeded in 1938, all came up to good stands. Forage production 1939–43, determined by sampling methods described earlier (E. S. R., 83, p. 763), showed that largest yields and animal gains per acre were obtained on pastures containing alfalfa. Grasses seeded alone produced about 40 percent less forage and 50 percent smaller gains in live weight. Analyses indicated a very favorable increase in protein and Ca content of the mixtures where alfalfa was seeded with either grass. See other notes (E. S. R., 89, p. 660).

Recommended practices for Delta pastures, H. W. BENNETT (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 10, pp. 1, 2*).—Seedbed preparation, seed mixtures and seeding methods, and management practices are indicated for Delta pastures from results of a survey in 1944 and pasture experiments in the State.

Legumes of the Hawaiian ranges, E. Y. HOSAKA and J. C. RIPPERTON (*Hawaii Sta. Bul. 93 (1944), pp. 80, illus. 49*).—Descriptions of 49 of the legumes found in Hawaiian pastures, ranging from small annuals to large perennial trees and shrubs, set forth their characteristics, growth habit, origin, distribution and habitat, importance, and uses. A key to the species, a glossary, and an index are included, and comments are made on the value of legumes in pasture and their zonal distribution and adaptability. Related studies on grasses (E. S. R., 81, p. 640) and vegetation zones (E. S. R., 89, p. 437) have been noted.

1942 report of the uniform advanced alfalfa nurseries, H. M. TYSDAL (*U. S. Dept. Agr., Bur. Plant Indus., 1942, pp. 17+, illus. 1*).—In this report on the uniform and uniform advanced alfalfa nurseries (E. S. R., 90, p. 40), the forage yield data are summarized from a total of 22 stations, seed yields from 4 stations, observations on leaf and stem diseases from 6, and reductions in stand from 4 stations. The history, general characteristics, and performance of the Atlantic (A–145), Buffalo (A–11), and Ranger (A–136) new varieties are appended.

1943 report of the uniform alfalfa nurseries, H. M. TYSDAL (*U. S. Dept. Agr., Bur. Plant Indus., 1943, pp. 20+*).—Forage yields of 20 varieties and strains are summarized from advanced alfalfa nurseries in 19 stations, and stand survivals are given. Notes on rapidity of recovery after cutting, leaf-spot diseases, bacterial wilt, and leafhopper yellowing were also reported by several States. Observation nurseries in 5 States are reported and notes on the origin, and characteristics and behavior of Nemastan alfalfa are included.

Heredity and environment in the production of hard seeds in common beans (Phaseolus vulgaris), G. A. LEBEDEFF (*Puerto Rico Univ. Sta. Res. Bul. 4 (1943), pp. 27+, illus. 7; Span. abs., pp. 26–27*).—Seeds of 36 selections of common white beans were dried over $CaCl_2$ to 10 different moisture contents, ranging on the average from 14.11 to 5.59 percent. No hard seeds were found in the control (15.14 percent moisture), while lots with 14.11 percent moisture contained 1 percent. Hard seed percentage rose with each reduction in moisture content, and such seeds remained hard for a longer time. They averaged about 90 percent for all selections at 5.59 percent moisture. Hard seed production in seed of different degrees of viability, including nonviable seeds, resembled that of viable seeds of like moisture content. No selection was free from hard seeds; indeed most selections developed a relatively high percentage of hard seeds when seed moisture content was reduced. Some developed more hard seeds than others of the same moisture content; hard seeds in some selections softened readily when tested for germination while in others they remained hard for a long time. The high, significant correlations found between hard seed percentages in all 36 selections on the same or different days of various germination tests, regardless of season in which grown, age, viability and seed moisture content, indicated that differences among individual selections in regard to hard seed production are hereditary.

Maintenance of alfalfa stands, M. NELSON (*Arkansas Sta. Bul. 447 (1944), pp. 30, illus. 3*).—Time of cutting and other factors affecting stands of alfalfa (E. S. R., 62, p. 33), studied 1929–39, indicated that to produce good yields of alfalfa consistently a soil must contain plenty of Ca, P, and K, and the alfalfa must not be cut too often or too late in the fall if stand is to be maintained.

Alfalfa cut often and at the succulent stage suffered a very rapid and large reduction in stand. Comparison of development among roots cut at this stage, blossom stage, and seed-pod stage suggested that loss of stand was due to inability of the plant to store up root reserves enough to promote growth after frequent cutting. Roots were much smaller in diameter and shorter, and when placed in a dark room in sand kept wet with a nutrient solution no growth appeared after nearly 2 mo. On the other hand, new shoots were started from roots of plants cut in blossom and seed-pod stages. The largest roots harvested were from plants cut in the seed-pod stage. The longer cutting was delayed apparently the opportunity was better for maintaining stands. No benefit was derived from cutting alfalfa late in the fall and loss of stand might occur, presumably because the crowns had no protection against winter freezes. Fall growth of uncut alfalfa made a protective covering for the crowns. Yields were largest after no fall cutting in the previous year and smallest when alfalfa was cut in the succulent stage. Good stands and good yields were maintained whenever soil productivity was kept up. Superphosphate appeared to be associated with vegetative growth, and yields after fertilizer mixtures omitting superphosphate were much lower.

Other factors apparently detrimental to alfalfa stands were a crown rot which worked from the crown downward into the root, anthracnose, and leaf spot; white grubs and grasshoppers; and climatic variations, especially periods of drought.

Time and rate of synthesis of phytin in corn grain during the reproductive period, E. B. EARLEY and E. E. DETURK. (Ill. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 10, pp. 803–814, illus. 3*).—The course of phytin synthesis in developing grain of Station Reid Yellow Dent corn was followed from before pollination to maturity, particularly in the 2-week period just after pollination. Although time of initiation of phytin synthesis in developing grain was not definitely established, phytin was present in the pistillate structure before fertilization, its concentration being 0.013 percent, or 2.1 percent of the total P. Phytin remained at this low level for 2 weeks after pollination, in agreement with previous findings (E. S. R., 69, p. 41). Weekly gain in percentage of phytin P in developing grain rose from the second to fourth week, diminished somewhat during the fifth, and nearly ceased during the sixth week. Synthesis then increased rapidly during the seventh week after which there was no further formation of phytin in the grain. Maximum rate of synthesis occurred in the seventh week after pollination, during which 25.3 mg. of phytin P were formed daily per ear. Formation of phytin during the first 4 weeks did not occur at the expense of nonphytin P stored in the immature seed, because translocation from stalks and leaves or, in part, from the soil supplied as much as was needed for phytin formation. During the fifth to seventh weeks nonphytin P already in the developing grain contributed part of that used in phytin synthesis. The amount was greatest in the seventh week.

The cellular structure of the ovule evidently is laid down largely during the first 4 weeks after pollination, with its full complement of nonlabile P. Active phytin synthesis accompanies this reaction during the third and fourth weeks and then becomes the dominant P reaction through the seventh week, when it is essentially completed. At full maturity, 10 weeks after pollination, phytin P amounted to 0.271 percent, or 88 percent of the total P.

Phytin was also found in corn pollen and silks, the percentage of phytin P being 0.043 and 0.017, respectively.

Some effects of the waxy and sugary genes on endosperm development in maize, R. H. ANDREW, R. A. BRINK, and N. P. NEAL. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 9, pp. 355–371, illus. 6*).—The pairs of allels, waxy (*wx*) and nonwaxy (*Wx*), and sugary (*su*) and nonsugary (*Su*), which influence storage products of corn endosperm were considered. Four types of pollen, *SuWx, suWx, Suwx,* and *suwx,* were applied under controlled conditions to *suwx* plants, and ear samples were taken periodically during development. That sugary endosperms contain more water-soluble polysaccharides than nonsugary endosperms was confirmed. Presence of the waxy gene further increased the percentage of the water-soluble fraction. Sugary kernels lose their moisture less rapidly with advancing maturity, and at maturity nonsugary kernels have a greater dry weight than sugary ones. Greater resistance to puncture of starchy kernels was due in part to pericarp tissue and in part to endosperm tissue. Neither of the starchy endosperms (*SuWx* and *Suwx*) were found to give desirable products. The waxy gene delays the optimum canning stage of sweet corn without, however, increasing the duration of the canning stage.

The ecology of kok-saghyz pollination [trans. title], M. S. GHILAROV (M. S. GILIAROV) and T. (F.) N. PRAVDIN (*Izv. Akad. Nauk S. S. S. R.* (*Bul. Acad. Sci. U. R. S. S.*), *Ser. Biol., 1943, No. 6, pp. 343–360, illus. 3; Russ. text; Eng. abs., pp. 359–360*).—*Taraxacum kok-saghyz* is an insect cross-pollinated plant. Under natural conditions in the regions studied this is mainly by bees of the genus *Halictus;* under cultivation, by honeybees as well as by *Halictus* bees. The frequency with which the Russian dandelion was visited by pollinating insects depended on the temperature, both groups of bees working at an average temperature of 17° C. and stopping below 13°. Above an average of 17°, bees predominated among the pollinators; at the lower temperatures first place was held by flies. Under field conditions domesticated bees took only nectar, the pollen being taken by *Halictus* bees. In their working flights to plantations, honeybees covered a radius of over 3 km.; the time required to pollinate one flower head averaged 80 sec. A seed-producing planting must be provided with a sufficient number of bees to insure the simultaneous work of 1,000 individuals per hectare of plantation. In breeding work during winter-spring, no artificial pollination is needed provided the hives are kept in the greenhouse. Under these conditions the bees take the pollen as well as the nectar.

On the mechanism of the action of heteroauxin, A. A. PROKOFIEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 5, pp. 233–237*).—Plants with rubber-producing roots such as tau-saghyz, kok-saghyz, and kyrm-saghyz are ordinarily propagated by seed; though some of them may be increased by vegetative methods, it is only within a narrow range. Only a negligible proportion of tau-saghyz cuttings, for example, developed roots satisfactorily; in this case it appeared probable that after leaves had formed the cuttings failed to root because the necessary nutrients had been used up in developing the leaves. On the basis of the experimental work described and tabulated, it is concluded that the effect of heteroauxin on the cuttings consisted in suppressing the processes leading to leaf formation. As a result, the plastic substances available in the cutting could be mobilized for building up new roots. Plants forming adventitious roots poorly required higher concentrations of heteroauxin for suppression of leaf formation.

Milkweed floss production, C. M. HARRISON (*Michigan Sta. Quart. Bul. 27 (1944), No. 1, pp. 35–38*).—Studies of factors involved in collection of pods from wild milkweed (E. S. R., 91, p. 282) and possible development of the plant as a profitable farm crop were made in northern counties of the Lower Peninsula. Large expansion of supplies in Michigan evidently cannot be expected from wild stands, but possibilities of profitable returns from cultivated stands in the Michigan area do not appear promising. Gross returns per acre from milkweed in Emmet County in 1943 were $12.00 compared with corn 1942 average yields and November 15, 1943 prices, $38.76; wheat, $28.64; oats, $30.60; hay, $16.10; potatoes, $198.80; and beans, $46.80.

Control field tests of 1944 seed oats, M. T. MUNN. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, pp. 13, 15*).—In test plantings of 52 large stocks, the better-adapted oats varieties as Lenroc and Cornellian were outstanding and those sold as Victory also gave satisfactory yields, while other stocks were usually badly mixed and few made good yields. Low germination was attributed to adverse effects of weather at harvest. Contamination with wild mustard and related *Brassica* spp., wild oats, wild buckwheat, and quackgrass was found in a number of stocks.

Effects of processing on germinative capacity of seed of tall oatgrass, Arrhenatherum elatius (L.) Mert. and Koch, J. L. SCHWENDIMAN and L. A. MULLEN. (U. S. D. A. coop. Wash. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 9, pp. 783–784*).—Tall oatgrass seed was processed to remove awns by hammering (E. S. R., 83, p. 618). Tests on the check, seed milled once, and seed milled twice, and 100 percent dehulled showed that injury could be held to a very low percentage with any of the treatments. Germination tests at 14, 26, 48, and 59 mo. after processing indicated that seed milled twice just after harvest can be stored safely until the second planting season following production. It can be easily handled with planting machinery. Seed completely dehulled should not be prepared until shortly before time of planting.

Peanut production experiments, 1931–41, C. K. MCCLELLAND (*Arkansas Sta. Bul. 448 (1944), pp. 27*).—Experiments with peanuts at the station and the Fruit and Truck Branch Station (Hope), concerned with varieties, spacing, liming, and relative nut and hay yields, continued earlier work (E. S. R., 65, p. 633).

Acre yields among 11 varieties and selections at the station ranged from as low as 22 lb. up to 4,455 lb. Average yields usually were above 1,300 lb. per acre. Hay yields ranged from 0.61 to 5.13 tons per acre, most average yields exceeding 2 tons. White Spanish, Improved White Spanish, Red Spanish, Spanish Selection

100, and Virginia Jumbo produced high average yields of peanuts; White Spanish, Valencia, Red Spanish, North Carolina Runner, and Virginia Jumbo made high yields of hay. At Hope, White Spanish, North Carolina Runner, Improved White Spanish, and Virginia made high yields of peanuts; and North Carolina Runner, Virginia, and White Spanish led in hay production. Several other strains under test also made good yields of hay and seed.

Highest yields from Valencia in spacing tests at the station were obtained from 30- by 8-in. spacing, and from Spanish strains from the 36- by 8-in. spacing, but neither differed much in yield between 30- and 36-in. rows. The 30- by 8-in. spacing produced higher hay yields with both varieties. At the station, on land with pH 5.42 to 5.65, crushed limestone (1,056 lbs. per acre) in the rows resulted in acre gains of 890 lb. of peanuts and 1.03 tons of hay.

Shelling percentages for Spanish types ranged from 73 to 80 percent at the station and 69 to 73 percent at Hope; for slender-podded varieties, from 64 to 67, and 62 to 65 percent, and large-podded varieties, 51 to 64, and 65 to 68 percent, respectively. Average number of pods per pound at the station ranged from 234 pods per pound in one 3-yr. period to 548 in another. The average number of peanuts for Spanish strains were from 935 to 1,128 nuts (seeds) per pound and for the larger-seeded varieties Jumbo 800, White Virginia 903, and Tennessee Red 748. Considering their high yields of both nuts and hay and higher oil content, the Spanish strains are recommended as best for Arkansas conditions.

Results of potato variety tests at Hastings, Florida, A. H. EDDINS, E. N. McCUBBIN, and F. J. STEVENSON. (Fla. Expt. Sta. and U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 10, pp. 269–277*).—Sebago, Sequoia, and Pontiac, new potato varieties which have proved more resistant to freezing injury in the early stages of growth and more drought resistant than 11 other varieties, have produced the best yields in test plats at Hastings, 1938–44. In yields of U. S. No. 1 tubers per acre, Sebago and Pontiac yielded 32 and 33 percent more and Sequoia 50 percent more than Katahdin. Within the period Sebago and Katahdin have supplanted Spaulding Rose, the old standard variety, and have become leading varieties at Hastings. In 1944, 65 percent of the acreage was planted to Sebago and 28 to Katahdin.

Field comparisons of Colloidal Phosphate and superphosphate as sources of phosphorus in potato fertilizers, B. E. BROWN, J. A. CHUCKA, A. HAWKINS, and J. C. CAMPBELL. (U. S. D. A. and Maine and N. J. Expt. Stas.). (*Amer. Potato Jour., 21 (1944), No. 9, pp. 241–249, illus. 3*).—In all of the 13 comparisons, potato plants fertilized with mixtures formulated with superphosphate made greater yields than those receiving mixtures having Colloidal Phosphate (waste-pond phosphate) as the P source. In Maine, the increase for 8 tests averaged 68 bu. per acre in favor of superphosphate; in New Jersey, 1 test, 27 bu.; in Pennsylvania, 2 tests, 24.5 bu.; and in Virginia, 2 tests, 64 bu. The more favorable influence of superphosphate fertilizers on earlier emergence, vine development, tuber set, and number of marketable tubers produced was pronounced. "The results reported herein afford a pattern showing (1) that the use of Colloidal Phosphate as a source of phosphorus in potato fertilizers is not justifiable, and (2) that the maintenance of normal vine growth and maximum potato yields requires the use of a material high in available phosphorus as the source of phosphorus in potato fertilizers."

How to pick more potatoes, J. L. PASCHAL (*Colorado Sta. Press Bul. 98 (1944), pp. [6], illus. 12*).—Time-saving methods and equipment enabling producers to increase the number of sacks of potatoes picked per day are based on studies in the Greeley area of Colorado.

Sheared sugar beet seed with special reference to normal and abnormal germination, B. TOLMAN and M. STOUT. (U. S. D. A.). (*Jour. Amer. Soc.

Agron., 36 (1944), No. 9, pp. 749–759, illus. 3).—Germination of sheared sugar beet seed, whole seed balls, and naked seeds was compared on blotters and soil in special glass germinators and also in the greenhouse bench. Most of the naked seeds and 12 to 15 percent of the sheared seed germinated abnormally, evidenced by the cotyledons breaking away from the starchy food reserve during initial stages of germination and before radicles had developed and become established. Cotyledons did not remain in a position to be pushed through the soil and some loss in geotropic response was also apparent. Due to these abnormalities very few seedlings from naked seeds and imperfect sheared seeds emerged from the soil when planted deeper than ½ in. Blotter germination tests evidently gave an erroneous impression of the percentage of seed recovered in shearing unless care was taken to differentiate between normal and abnormal germination.

El tabaco en la republica Argentina [Tobacco in Argentina] (*[Buenós Aires] Inst. Agr. Argentino, "Resiñas," 4 (1944), No. 28, pp. 137, illus. 34).*—Tobacco production is considered in consecutive chapters, dealing with the Argentine tobacco problem, by R. J. Fernández (pp. 17–22); soil and climatic conditions, by J. M. Alazraqui (pp. 23–29); plant bed practices, by F. I. Olivera (pp. 31–39); transplanting, by D. R. Pasquale (pp. 41–48); selection of seed, by J. Llorca (pp. 49–57); harvesting and curing, by R. C. Ferrari (pp. 58–67); economic importance of the crop, by V. S. Solari (pp. 69–73); costs of producing Virginia and Criollo Salteño types, by V. Mele (pp. 74–98); utilization of tobacco residues and byproducts, by G. E. Cavia (pp. 99–111); and history of the use of tobacco, by M. P. Skiadaressis (pp. 112–119). Tobacco statistics are appended.

The fermentation of cigar-leaf tobacco as influenced by the addition of yeast, M. F. Gribbins, D. E. Haley, and J. J. Reid. (Pa. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 9, pp. 373–381).*—It is concluded from fermentation studies with bakers' yeast applied to Pennsylvania cigar-leaf tobacco (1940–41 crop) that initial temperature gains were greater with all yeast-treated tobacco under the experimental conditions, a more rapid initial fermentation was evidenced in the yeast-treated samples, and addition of yeast stimulated the development of organisms considered necessary to the process. With but few exceptions, a high bacterial count was paralleled by a low mold content, which is considered highly desirable.

Characteristics and origin of Blackhull wheats, E. G. Heyne and L. P. Reitz. (U. S. D. A. and Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 9, pp. 768–778, illus. 2).*—Blackhull, Superhard, Clarkan, Kanhull, Chiefkan, and Red Chief winter wheats, developed by E. G. Clark near Sedgwick, Kans.; and Early Blackhull, selected by A. P. Haeberle near Clearwater, Kans., and described in this discussion, have high test weight, good yield, and attractive appearance. These varieties differ in kernel characters. Blackhull is softer than Turkey; Superhard resembles Blackhull in size and shape, but is harder in texture and does not bleach readily in the field. Red Chief and Chiefkan have the sway-back character sometimes found in Harvest Queen and other soft wheats. Red Chief, like Superhard, is resistant to weather bleaching in the field. Clarkan is a soft wheat with a short, plump, fairly dark-colored berry. Grain from the varieties with hard texture almost never shows any yellow berry. The Blackhull wheats are not so winter hardy as Turkey, and are susceptible to loose smut and bunt but have some tolerance to hessian fly. Blackhull and Chiefkan have some tolerance to leaf and stem rust. These wheats have a characteristic yellowing or chlorotic stippling of the leaves varying in expression from season to season and in one cross inherited as a simple recessive factor, and also carry a lethal complementary factor *Le2* (E. S. R., 90, p. 466), commonly found in soft but not in hard varieties.

The Blackhull wheats have a rather short wheat meal fermentation time, thick bran, flour yields not as high as test weights would indicate, and a short dough-mixing time. Blackhull has been accepted by the trade as a hard wheat and Clarkan as a soft wheat. Chiefkan, Red Chief, Superhard, and Early Blackhull apparently do not equal Blackhull in baking characteristics.

Reduction in yield of winter wheat due to removal of heads at heading time, H. M. Brown. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 9, pp. 779–782*).—Percentage reduction in yield, 1938–41, due to removal of certain percentages of spikes at heading time (simulating destruction by loose smut) approximated percentage reduction in number of heads. Closeness of approximation was influenced by seasonal and varietal differences.

Report of the Eighth Eastern Wheat Conference, Cincinnati, Ohio, November 10, 1943, B. B. Bayles. (U. S. D. A.). (*East. Wheat Conf. Rpt., 8 (1943), pp. 16, illus. 1*).—Included are the following papers: Physiologic Specialization in *Ustilago tritici* and the Effect of Vernalization on the Incidence of Loose Smut in Artificially Inoculated Winter Wheat, by W. M. Bever (pp. 1–4) (U. S. D. A. and Ill. Expt. Sta.); Status of Breeding for Hessian Fly Resistance in the Soft Red Winter Wheats, by R. M. Caldwell, W. B, Cartwright, and L. E. Compton (pp. 4–5) (Ind. Sta. and U. S. D. A.); The Effect of Level of Soil Fertility on Wheat Quality, by W. W. Worzella (pp. 5–6) (Ind. Sta.) (see also E. S. R., 92, p. 49); Tests Useful in Evaluating Soft Wheat Varieties, by V. H. Morris (pp. 6–10) (U. S. D. A. and Ohio Sta.); Quality Problems of Soft Wheat Flour, by G. Garnatz (pp. 11–15); and General Aspects of the Soft Wheat Improvement Program, by B. B. Bayles (p. 16) (U. S. D. A.).

Preliminary report on the weeds of Alabama, R. M. Harper (*Ala. Geol. Survey Bul. 53 (1944), pp. 275, illus. 2*).—Weeds occurring in the several regions of the State are listed with remarks on locality, where found, and abundance; families and genera are cataloged; and literature on weeds in Alabama and elsewhere is reviewed. A statistical summary, a classification by families, and an index are included.

Bindweed control, C. I. Seely, K. H. Klages, and E. G. Schafer. (Coop. U. S. D. A. and Idaho Expt. Sta.). (*Washington Sta. Bul. 176 (1944), pp. 7*).—Continuous cultivation, cultivation and cropping, and chemicals as control measures for bindweed were studied since 1936 on a farm between Uniontown, Wash., and Genesee, Idaho.

Cultivation of bindweed (deep enough to be thorough) might best begin just after grain harvest in summer or about 2 weeks after the weed starts spring growth, and should be done at 14-day intervals as long as growth continues, normally about 10–12 cultivations per season. All plant residues should be used so far as possible. On areas subject to erosion, cultivated land may be replowed 8 to 9 in. deep in late September and seeded to winter rye 2 bu. per acre, which may then be plowed or disked the next spring and cultivation continued as before. A successful method found especially suited for large areas is a combination of intensive cultivation and a fall-sown grain. Land is plowed and cultivated during summer as indicated above for continuous cultivation and fall seeded to winter wheat, rye, or barley. Experiments indicated that bindweed is easier to eradicate if the land is replowed 8 to 9 in. deep just before seeding. Another method, even more successful where alfalfa is adapted, is to grow alfalfa or alfalfa and grass for 3 to 4 yr., plow up alfalfa after the first hay crop of the last season, and cultivate every 14 days until time to seed fall grain. Fall grain is then alternated with fallow, and cultivated as indicated above until eradication is completed. A stand of alfalfa on bindweed-infested land has been obtained best by cropping to grain, plowing deep just after harvest, and seeding to alfalfa early the next spring.

Sodium chlorate, most practical of chemicals for bindweed eradication, should be applied late in the fall, the rate depending upon locality but usually varying from 2 to 3 lb. per square rod on nonirrigated land and from 4 to 5 lb. on irrigated land. Carbon bisulfide, effective when properly used, is expensive and is justified only on valuable land and where bindweed must be eradicated without residual effect on the soil.

Presence in the soil of a high content of bindweed seed which may produce seedlings during several years is an additional problem. Seedling control studies indicated that competition from good fall grain generally suffices to control seedlings emerging in that crop, providing the stubble is plowed just after harvest. Where summer fallow is practiced, monthly cultivation will control seedlings coming up during the fallow year.

HORTICULTURE

The speed graphic synchronized flash camera in horticulture, N. F. CHILDERS. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 319–322, illus. 2*).—The author discusses the operation and potential benefits from the use of high speed cameras.

An automatic watering system saves labor in greenhouses, K. POST. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10 (1944), No. 4, pp. 12, 13, illus. 3*).—A description is offered for a method of watering potted and other greenhouse-grown plants, based on the use of capillary tension in the soil.

Chemical testing of insecticides and fungicides a safeguard, A. W. AVENS. (N. Y. State Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10 (1944), No. 4, pp. 7, 14*).—Weaknesses in the State law and new problems in the inspection are briefly discussed.

The quality of vegetable seeds on sale in New York in 1943, M. T. MUNN (*New York State Sta. Bul. 707 (1944), pp. 43*).—Examination of 1,528 samples of vegetable seeds purchased in the open markets by officials of the State Department of Agriculture and Markets showed approximately 72.4 percent of the stocks to be acceptable for planting as far as could be determined by laboratory tests. Of the balance, 26.1 percent were deficient in one or more respects while 1.5 percent were practically worthless. Something over 15 percent were incorrectly labeled as to germination. Certain seed collections purchased unofficially by mail and which were intended for resale did not prove at all satisfactory. Detailed results of the tests are presented in tabular form.

Experimental methods in cabbage breeding and seed production, C. H. MYERS and W. I. FISHER ([*New York*] *Cornell Sta. Mem. 259 (1944), pp. 29, illus. 6*).—Various technics used in cabbage breeding studies are described and discussed with a view to aiding other workers in the improvement of this vegetable. Because the cabbage is ordinarily a biennial, there are difficulties in northern regions in overwintering the plants, but the use of a cold-storage plant solved the problem of overwintering in a satisfactory manner. Prevention of undesired cross pollination was a problem in the field and made necessary the elimination of other crucifiers such as kale, brussels sprouts, and kohlrabi which may have wintered over in nearby vegetable gardens. Honey bees are frequent visitors to cabbage flowers and must be prevented from introducing strange pollen, as by isolating the plantings or by covering individual plants with muslin or cheesecloth. As to chromosome numbers, cabbage, cauliflower, kale, brussels sprouts, and radish had 9, turnips and wild cabbage 10, rape 18, and rutabaga 19. Despite these differences, crosses were made between domestic and wild cabbage.

Disease and insect control on hops, R. O. MAGIE (*New York State Sta. Bul. 708 (1944), pp. 20, illus. 4*).—Describing the various fungus and insect enemies of the hop plant, the author presents the results of control experiments conducted in Oneida County during a 7-yr. period. The spray schedule recommended for late varieties includes four applications of 6–4–100 bordeaux plus 4 or 5 lb. of wettable sulfur dust to control both downy and powdery mildews. When aphids are present 1 pt. of nicotine sulphate is added. Sooty mold, which develops on the honeydew deposited in the hop cones by the aphids, may be controlled by two applications of nicotine sulfate, the first applied in the last bordeaux-sulfur spray and the second just prior to harvest. Insects and fungi were controlled more effectively and more economically by liquids than by dusts. Dusting may become, however, a useful supplement in case of a serious outbreak of mildew because of more rapid application, and a copper-containing dust may be useful in early spring when the soil is too wet to support a heavy spray outfit.

Seek tough rind for Honey Cream melon, D. D. DOLAN and H. M. MUNGER. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10* (*1944*), *No. 4, pp. 4, 5, illus. 1*).—The Honey Cream watermelon, despite its yellow flesh, has become a popular variety in New York State. However, its tender rind has limited its usefulness to roadside stands and local markets. Crosses and backcrosses have been made to Tom Watson, a variety with a tough rind, to add toughness of rind to Honey Cream. A lever device for testing the toughness of rinds of watermelons is illustrated.

Tomato varieties, Poplarville, Mississippi, 1944, T. E. ASHLEY (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 10, pp. 1, 7*).—On the basis of marketable fruit, Rutger Certified was first and Stokesdale second in production in a 1944 trial which included 11 varieties.

Freezing injury of fruits and vegetables, D. H. ROSE, R. C. WRIGHT and C. O. BRATLEY (*U. S. Dept. Agr. Cir. 713* (*1944*), *pp. 31, illus. 3*).—Based on the results of observations on the market and during investigation under controlled conditions, information is presented on the resistance and susceptibility of various fruits and vegetables to freezing injury, on methods of handling frozen produce to promote recovery, and on methods of wrapping and packaging to reduce freezing hazards. Commodities are grouped according to their susceptibility to low temperature injury. For example, avocados, bananas, lemons, limes, and pineapples suffer chilling injury at temperatures as high as 45°–55° F.; tomatoes, potatoes, eggplant, and cucumber are injured at temperatures close to 32°; and certain other products such as apples, cabbage, cauliflower, and onions are injured very little if at all by one light freezing, provided they are not handled while frozen. The freezing point of a commodity is not necessarily an index to its susceptibility to injury. Tomatoes and parsnips freeze at 30°, yet the former are ruined by the exposure and the latter practically unharmed. The principles underlying the freezing and thawing of plant tissues are discussed briefly to throw light on the various observations.

Effect of ground cover on the freezing and thawing of orchard soils, R. J. BARNETT. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44* (*1944*), *pp. 57–65, illus. 7*).—Studies of the behaviour of frost in open field soil under various surface conditions and covers showed the situation to be complex. Duration of the period of low air temperature as well as the minimum reached was an important factor in determining penetration. The lag of the deepest penetration following the minimum temperature was from 8 to 15 days for the different treatments. Snow was shown to be a highly effective insulating agent. Emergence of frost from the soil proved more complex than its penetration into the soil because of the combined effects of air temperature above and soil temperature below in melting the ice.

A new orchard crop—domestic rye grass, T. A. MERRILL (*Michigan Sta. Quart. Bul., 27* (*1944*), *No. 1, pp. 107–108, illus.* 1).—Tested in various sections of the western Michigan fruit-producing area, domestic or Italian ryegrass gave promising results as a winter cover. Good winter survival was noted in the open season of 1943–44 when there was little snow cover. In fertile soil, this ryegrass makes an abundant growth.

Dwarf and semi-dwarf fruit trees, H. B. TUKEY. (N. Y. State Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10* (*1944*), *No. 4, p. 14*).—Apple trees on Malling rootstocks have withstood temperatures of —30° F. on a light soil in the Hudson River Valley. Red Spy trees on Malling I planted in 1938 bore a bushel of fruit in 1943. Varietal compatibility with the rootstock was evident, with McIntosh doing well on Malling I, Cortland on Malling XIII, etc.

Spray and dust equipment receives attention, L. M. MASSEY and C. E. PALM. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10* (*1944*), *No. 4, pp. 6–7, illus. 2*).—A combination duster and sprayer, which has been in use experimentally for the past 4 yr., has been redesigned to streamline the air flow, and it now gives fairly good coverage on apple trees 25 to 30 ft. tall and a better job on smaller trees such as peaches and cherries. The high-volume low-velocity principle whereby the atmosphere about the tree can be replaced by one charged with a fungicide and an insecticide is deemed advantageous and offers real possibilities for better disease and insect control and less injury to the foliage.

History of apple breeding at the Geneva Station, R. WELLINGTON. (N. Y. State Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10* (*1944*), *No. 4, pp. 2–3, 15, illus. 1*).—A summary account is presented of the proceedings and results of apple breeding studies begun in a small way at Geneva in 1892 and continuing up to the present time. Although much of the early effort was futile due to a lack of knowledge of chromosomes, harmful effects of inbreeding, etc., there has gradually evolved a mass of basic information as to productive parents, effective technics, etc., which promises much for the future. Certain of the station productions, such as Cortland, Lodi, and Milton, have achieved a position in New York State fruit growing.

Growth and fruitfulness of two apple varieties on French crab seedlings and and on a clonal rootstock, R. H. SUDDS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *44* (*1944*), *pp. 247–250*).—A planting of Winesap and Delicious apple trees was established in 1927 near Morgantown, W. Va., to compare growth and yield on a clonal rootstock U. S. D. A. T–200 and on commercial French crab seedlings. A summary of records taken over the 17-yr. period since planting showed no significant difference in yield in either variety that could be attributed to rootstocks. Growth as indicated by trunk girth was significantly less on the T–200 stock. Winesap trees on T–200 stock were more uniform in yield than those on French crab. With Delicious both yield and trunk girth were more uniform on T–200 than on French crab but not to the point of actual significance. The author suggests that causes other than rootstocks must account for most of the variation in growth and production observed in deciduous orchards.

The development and structure of the apple leaf, L. H. MACDANIELS and F. F. COWART ([*New York*] *Cornell Sta. Mem. 258* (*1944*), *pp. 29, illus. 29*).—Emphasis is placed upon the structure of the mature leaf as an organ of photosynthesis and upon those stages in development between the formation of the leaf meristem from the terminal stem growing point and maturity. The time required for the expansion of apple leaves varies over a wide range depending chiefly on temperature. The stomatal structure of apple leaves was essentially the same as in other plants. The number of stomates varied somewhat with vigor of growth, size of leaf, etc., the average being about 350 to 400 per square millimeter with extreme variations of from 200 to 700.

Influence of sulphur sprays on the trunk diameter of young apple trees (second report) E. P. CHRISTOPHER and S. A. PIENIAZEK. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, *44* (*1944*), *pp. 99–100*).—In this paper (E. S. R., 89, p. 68) covering the first 5 yr. in a young apple orchard, evidence is set forth in favor of mild sulfur sprays over lime-sulfur 1 : 50 for protecting the young trees. With McIntosh, all spray treatments except lime-sulfur 1 : 50 were significantly better than no treatment. With Baldwin, trees sprayed with lime-sulfur 1 : 50 through the season, either day or night, made significantly less growth than the check trees and those receiving other spray treatments.

Some results in correcting magnesium deficiency in apple orchards, L. SOUTHWICK and J. K. SHAW. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 8–14*).—Application of four sprays of a solution of 16 lb. of Epsom salts in 100 gal. of water to 5-year-old apple trees which had shown considerable foliage scorch in preceding years gave good results. Of 146 treated trees, only 1 showed severe scorch and 94 showed no trace of it. Two sprays were helpful but not nearly as effective. Autumn applications of magnesium compounds to the soil benefited young mulched trees the succeeding growing season, but no benefit to older trees growing in sod. Magnesium limestone broadcast at the rate of 50 lb. per tree on top of the soil was of no benefit to 4-year-old McIntosh trees. Where Epsom salts were used with the limestone, there was a distinct improvement.

Sawdust, seaweed, and meadow hay as mulch for McIntosh apple trees, L. P. LATIMER and G. P. PERCIVAL. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 49–52*).—Because the majority of New Hampshire apple orchards are grown on hillsides where cultivation is difficult or impractical and with inadequate grass cover for mulching, there is need of outside mulching material. Comparisons were made of sawdust, seaweed, and meadow hay as mulching materials for young McIntosh apple trees. Hay and seaweed were outstanding with respect to yield and size of fruit. Color of fruit was better on the sawdust and sod plots, but the fruit on the hay and seaweed plots was sufficiently colored to meet the requirements for fancy grade. The pressure tester did not show any difference in maturity attributable to treatments. Quackgrass grew readily up through the sawdust, only slightly through hay, and not at all through seaweed.

Picking maturity of apples, M. H. HALLER and J. R. MAGNESS (*U. S. Dept. Agr. Cir. 711 (1944), pp. 23, illus. 2*).—Superseding Bulletin 1448 (E. S. R., 56, p. 345), this circular brings the subject up to date by including much new information, particularly on the average number of days from bloom to picking maturity in a large number of important apple varieties. Certain new varieties, such as Cortland and Golden Delicious, are included and mention made of color sports of various older apple varieties. The effect of harvest sprays on maturity is considered.

A report on the construction and operation of a grower-size apple waxing machine, A. VAN DOREN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 183–189, illus. 4*).—The machine uses the flotation system of applying the wax emulsion and a thorough coating is assured by the rolling of the apples in the emulsion. Golden Delicious apples lost much less weight when coated with wax emulsion than when handled in the usual manner.

The effectiveness of some cover crops for controlling erosion and runoff in a peach orchard, F. F. COWART and E. F. SAVAGE. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 53–56*).—In the spring of 1937, a peach orchard was established on an area with a uniform slope of slightly less than 6 percent. In the fall of 1937, three plots containing 12 trees each were established for measurement of runoff and erosion. For 2 yr. all plots were treated alike to yield information on inherent differences in runoff and erosion. In October 1939, Austrian field peas were planted on two of the plots and the third left fallow with some weeds. The Austrian pea did not prove a satisfactory winter cover because of its limited growth at that season. Kobe lespedeza proved to be a satisfactory cover with respect to erosion control, but since peaches need cultivation during spring and summer for best growth and performance lespedeza is not ideal.

Strawberries, C. H. OLDHAM [Gt. Brit.] *Min. Agr. and Fisheries Bul. 95 (1944), 2 ed., pp. 67+, illus. 14)*.—This second edition of a bulletin published originally in 1937 contains general information on the botany and history of the cultivated strawberry, varieties grown in England, areas in England and Wales devoted to strawberry production, general culture, brief summaries of investigations at various points in England, harvesting and marketing, control of pests, etc.

An evaluation of certain grape varieties for use as rootstocks, F. F. COWART and E. F. SAVAGE. (Ga. Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 315–318)*.—Observations in a vineyard comprised of rootstock varieties showed Dog Ridge, Warren, French, Lenoir, and Rupestris St. George to be vigorous growers. On the basis of more limited trials Champanel, Lukfata, and Herbemont appeared promising. In a stock scion trial established in 1934 Concord and Niagara grafted on Dog Ridge, Lenoir, Warren, and Rupestris St. George grew more vigorously and lived longer generally than on their own roots. In a second trial started in 1941, varieties on Dog Ridge, Champanel, French, Herbemont, Rupestris St. George, and Warren were making the best growth.

Marketing the Fredonia grape, T. A. MERRILL and B. W. KEITH *(Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 48–49, illus. 2)*.—Fredonia grapes packed in 2-qt. tomato tills and covered with Cellophane and then crated, eight tills per crate, sold readily on the Benton Harbor market and yielded the grower a substantial profit over that obtained for comparable grapes in 4-qt. baskets.

Root-contact phenomena in relation to iron nutrition and growth of citrus, P. L. GUEST. (U. S. D. A. coop. Calif. Citrus Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 43–48, illus. 3)*.—Sweet orange seedlings grown in sand cultures containing very finely ground magnetite made excellent growth, while those in cultures containing magnetite that was not finely ground made comparatively little growth, had small leaves and short internodes, and became definitely chlorotic. The results showed the importance of particle size and distribution of solid phase components in sand cultures or in soils. Sweet orange seedlings in sand cultures containing basic magnesium carbonate grew poorly and became definitely iron chlorotic, while other plants grown similarly but without magnesium carbonate made healthy growth. There was an apparent interference with normal iron nutrition.

Effect of trunk girdling on the performance of Washington Navel orange trees, A. D. SHAMEL and C. S. POMEROY. (U. S. D. A.). *(Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 80–84)*.—In late April 1939, a group of 41-year-old Washington Navel orange trees were girdled. In 1940 the treatment was repeated on one-half of those girdled in 1939. Yield records showed a significant increase following the original girdling treatment and again following the repeat girdling. However, when girdling was discontinued the production declined below that of trees which had not been girdled at all. When 4 years' yields were considered, the total yields of all the girdled trees were significantly greater than those of untreated trees. Increased yields from girdling were correlated with a decrease in size of fruits. The possible use of girdling as a means of obtaining increased yields in the war period is discussed.

Boron in the palms and soils of date gardens in the Coachella Valley of southern California, A. R. C. HAAS. (Calif. Citrus Expt. Sta.). *(Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 34–42, illus. 1)*.—The terminal buds of seedlings of the Deglet Noor date grown in solution cultures with insufficient boron died and the roots darkened and deteriorated. The water-soluble B content of the B-deficient plants was greatly reduced in comparison with the controls. The pinnae of the Deglet Noor variety growing in the same garden with other varieties were particularly high in B. Roughly 80 percent of the B in the pinnae was water soluble.

The ash of fruit strands plus the calyx remnants was comparatively high in B, and much of the B in the strands was water soluble. Date pollen contained about 20 p. p. m. of B, of which 6–8 p. p. m. was water soluble. An examination of the pulp and skins showed more B in Halawy, Barhee, and Maktoom than in Khadrawy and Deglet Noor. The soil in Coachella Valley date gardens was found to contain adequate concentrations of available B.

Trials in producing forcing roots of lily-of-the-valley, W. D. HOLLEY. (N. H. Expt. Sta.). (*Florists Exch. and Hort. Trade World, 103 (1944), No. 17, pp. 12, 13, illus. 3*).—The possibility of producing in southeastern New Hampshire lily-of-the-valley roots of high forcing quality was demonstrated. Fertile well-drained soil such as is used in vegetable production was found suitable, and with the selection of proper strains there can be produced a high percentage of high quality marketable flowers.

Nitrate tests for roses, K. POST and J. E. HOWLAND. (Cornell Univ.). (*Florists Exch. and Hort. Trade World, 103 (1944), No. 18, p. 10, illus. 2*).—Better Times hybrid tea roses grown at nitrate levels of 10, 25, 50, 75, and 100 p. p. m., produced well in the range of 25 to 100 p. p. m., with economical production between 25 and 75 p. p. m. Average stem length was not greatly different at any of the nitrate levels, even 10 p. p. m.

FORESTRY

Determining site quality in understocked oak forests, S. R. GEVORKIANTZ and H. F. SCHOLZ. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 11, pp. 808–811*).—Results of studies in stands of mixed oak in southwestern Wisconsin indicated that the most satisfactory quantitative measure of site quality is the average volume of all dominants in the stand. The site index, derived by multiplying the average basal area by the average height of dominant trees, was for practical purposes unaffected by the degree of stocking within the range of 50–120 percent of the normal and thus affords a good measure of site quality.

Classes of shortleaf pine nursery stock for planting in the Missouri Ozarks, A. G. CHAPMAN. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 11, pp. 818–826, illus. 6*).—A 2-yr. study with several classes of nursery stock in open cull oak and dense mixed oak stands on the Clark National Forest indicated that when survival, height growth, and costs are taken into consideration 1–0 seedlings are the most satisfactory stock for general use, and that spring planting gives better results than fall planting. Where fall planting is necessary 1–1 transplants are desirable.

Survival of hemlock seedlings in a relict colony under forest conditions, R. C. FRIESNER and J. E. POTZGER (*Butler Univ. Bot. Studies, 6 (1944), Papers 9–14, pp. 102–115, illus. 2*).—Observations on individual seedlings identified by numbered markers showed that each added year of age, other things being equal, gives hemlock seedlings a better chance of survival. Because of the shallow rooting habit of the hemlock, there was a definite relationship between percentage of seedling survival and percentage of normal rainfall, although no relationship was observed during the winter periods. Percentage of survival was generally lower during the summer than during the winter. Growth measurements over a 10-yr. period showed the marked ability of the hemlock seedling to withstand suppression.

Effects of snowbrush on the growth of Sierra gooseberry, C. R. QUICK. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 11, pp. 827–832, illus. 2*).—This greenhouse study confirmed field observations to the effect that snowbrush (*Ceanothus cordulatus*) has a favorable influence on the growth of Sierra gooseberry (*Ribes roezli*), probably because of the presence of nitrogen-fixing bacteria on the snowbrush roots.

DISEASES OF PLANTS

The utility of major foreign languages in phytopathology, J. H. McLaughlin. (Okla. A. and M. Col.). (*Science, 100* (*1944*), *No. 2599, pp. 355–356*).—To determine the trend in numbers of published contributions on phytopathology in German, French, Russian, Spanish, and Portuguese, counts were made of the papers in this field in the check lists of the U. S. Department of Agriculture for the years 1931. 1935, 1942, and 1943, the results being tabulated and discussed. It is deemed evident that the marked decrease of papers in the first three languages from the first 2 to the last 2 yr. is due mainly to total mobilization for war. In contrast there has been a steady increase in the numbers of papers in Spanish and Portuguese, indicating an increase in agricultural research in Latin America; the present and potential increase in numbers of contributions in these two languages and the potentialities of Russian agricultural science after the war are stressed, along with the need for more knowledge of these three languages as a corollary.

The Plant Disease Reporter, [October 1 and 7, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28* (*1944*), *Nos. 31, pp. 945–970; 32, pp. 971–994*).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals and grasses, field legumes, potatoes, vegetables, fruits, special crops, and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 31.—Peony diseases observed in a Pennsylvania nursery, by J. S. Niederhauser; further note on occurrence of elm phloem necrosis in Missouri, by T. W. Bretz; notes on the occurrence of *Tryblidiella* spp. in Florida, by A. S. Rhoads; preemergence losses and seedling root rot and their control in guayule nurseries, by B. Sleeth; diseases of soybeans in Arkansas by H. W. Larsh and in Indiana and Illinois by J. S. Tidd; corn diseases in Indiana by Tidd and in Missouri by Bretz; diseases observed on sorghum in Oklahoma and Arkansas, by H. W. Larsh; control of onion smut in Indiana with Arasan and Fermate, by C. T. Gregory; and summary of the more important plant diseases taken in connection with the insect and plant disease survey in the general vicinity of ports of entry from January 1944 to June 30, 1944.

No. 32.—Aster yellows on vegetable crops and weeds in the Winter Garden region of Texas, by S. S. Ivanoff and W. H. Ewart; potato diseases or injuries in Massachusetts by R. C. Cassell and in Wisconsin by E. E. Honey, R. E. Vaughan, and J. W. Brann; cotton boll rots and the fungi associated with them in Oklahoma in 1944, by W. W. Ray; observations on *Sclerotinia* root rot of guayule, by A. J. Braun; fungi isolated from diseased guayule, by J. T. Presley and L. Weston; alfalfa seed production in northern Minnesota, by I. W. Tervet; diseases of peanuts in South Carolina, by A. E. Prince; diseases of soybeans in Wisconsin, by Honey, J. G. Dickson, and F. R. Jones; fruit diseases in western Illinois, by Tidd and G. H. Boewe; and virus symptoms on Montmorency cherry in a bad fungous leaf spot year, by E. M. Hildebrand.

Report of the first annual meeting of the Potomac division of the American Phytopathological Society, Bureau of Plant Industry Station, Beltsville, Maryland, February 23 and 24, 1944 (*Phytopathology, 34* (*1944*), *No. 11 pp. 990–996*). —In addition to brief summaries of 5 papers on plant quarantines, abstracts are presented on 14 others dealing with fungicides and with diseases (viruses, bacteria, fungi, nematodes) of *Allium* spp., cantaloup, pepper, tobacco, grasses, barley, potato, sugar beet, strawberry, Easter lily, and violet.

Progress in the control of seed-borne diseases, G. A. Scott (*Ontario Crop Imp. Assoc. Ann. Conv., Toronto, Canada, 1944, pp. 35–39*).

Market diseases of fruits and vegetables: Beets, endive, escarole, globe artichokes, lettuce, rhubarb, spinach, swiss chard, and sweetpotatoes, G. B. Ramsey and J. S. WIANT (*U. S. Dept. Agr., Misc. Pub. 541 (1944), pp. 40, illus. 18*).—The ninth in a series (E. S. R., 89, p. 556) designed to aid in recognizing and identifying economically important pathological conditions in the channels of marketing, to facilitate the market inspection of these products, and to prevent losses from such conditions. Of the 18 plates, 7 are in color. There are 157 references.

Market diseases of fruits and vegetables, C. O. BRATLEY ET AL. (*Amer. Phytopath. Soc., War. Com., 1944, pp. 31+*).—This outline presents the symptoms and control measures for diseases most commonly found on harvested fruits and vegetables in transit, in storage, and on the market.

Greater production through control of plant diseases (*Arkansas Sta. Bul. 443 (1944), pp. 28–31*).—Included are brief summaries on breeding disease-resistant small grains, including rice; new developments in cottonseed treatment; and a preliminary report on peanut disease control.

Inorganic spray materials versus organic materials as fungicides and insecticides, R. H. HURT. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 10, pp. 8–9*).—Preliminary results with DDT and Fermate against apple scab and codling moth in Virginia are said to be promising.

Fungicides [at the Rhode Island Station] (*Rhode Island Sta. Rpt. [1943], pp. 24–26*).—Lauryl pyridinium bromide, lauryl quinolinium bromide, and lauryl isoquinolinium bromide at 5 p. p. m. were found to kill pathogenic fungus spores, their toxicity to which was unaffected by the pH value of the water; although poisonous to germs, they caused no injury to man, animals, or plant foliage. A second promising group of pesticides was found among the quaternary ammonium compounds. The inherent wetting power of both these groups of compounds is high. A third group investigated are members of a new type of organic mercury compounds. The best of them prevented germination of over 95 percent of the spores of *Macrosporium sarcinaeforme* at dilutions as low as 3 p. p. m. A fungicidal test whereby the "staying power" of a chemical can be forecast in 2 weeks is described.

A study of the fungistatic and fungicidal properties and of the toxicity for mice of sodium azide, J. A. HERRICK and J. E. KEMPF (*Jour. Bact., 48 (1944), No. 3, pp. 331–336*).—From the results of tests on *Aspergillus, Penicillium, Mucor, Trichophyton, Alternaria, Stereum, Blastomyces, Histoplasma,* and *Monilia,* it is concluded that the pronounced ability of NaN_3 to suppress the growth of fungi is due to its fungistatic action and that it has no practical fungicidal power.

The inhibiting effect of sodium azide on mold growth, J. E. KEMPF and W. J. NUNGESTER (*Science, 100 (1944), No. 2601, pp. 411–412*).—"The growth of molds on a variety of materials is of great economic and military significance. . . . In view of these facts, the chance observation that high dilutions of sodium azide (NaN_3) prevented the growth of *Penicillium notatum* seemed worthy of further investigation" as to its possible value as a chemotherapeutic agent. On the basis of animal tests briefly noted, NaN_3 appears to hold little promise for treating systemic animal infections; preliminary fungicidal tests against *P. glaucum, Aspergillus niger, Mucor rhizopodiformis,* and *Oidium albicans* are reported.

Bacterial leaf spot of oats caused in the USSR by Bacterium coronafaciens Ell., M. V. GORLENKO and A. I. NAYDENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 8, pp. 365–368*).—Studies of a leaf spot of oats in Russia showed it to be caused by bacteria identified as *B. coronafaciens*—cause of the disease known in the United States as halo blight. The source of infection was found to lay mainly in the preceding season's crop residues; to a smaller degree, in the seeds.

Physiologic specialization of oat stem rust in Canada, M. NEWTON and T. JOHNSON (*Canad. Jour. Res., 22 (1944), No. 5, Sect. C, pp. 201–216, illus. 2*).—During 1941–43, 12 physiologic races were identified from 2,586 isolates studied.

The annual surveys indicated that each year races 1, 2, and 5 comprised the bulk of the oats stem rust (*Puccinia graminis avenae*) in all parts of Canada, their predominance being greatest in the three Prairie Provinces where barberry is virtually nonexistent. With barberry present, other races of greater range in pathogenicity were found more frequently than in the above three provinces; the occurrence of such races, however, was sporadic until 1943, when races 8, 10, and 11 attained a wide distribution—apparently traceable to wind-borne spores from the south. There was evidence that the strains of these races present in 1943 remained in the uredial stage much longer than did strains of the same races collected previously—a fact that may have favored their spread in that year. The possibility that virulent races may also originate by mutation is suggested by the spontaneous pathogenic changes that occurred in the greenhouse in a culture of race 3 that gave rise to several cultures of race 7. The environal effects on the identification of physiological races were demonstrated by the seasonal influences on the reaction of the Sevnothree variety to races 1 and 11; here, the characteristic type 1 was frequently replaced in summer by type "x". A constant temperature of above 80° F. failed appreciably to affect the reaction to stem rust of adult plants of White Tartar and Richland—or other varieties of the same type of resistance—but was capable of breaking down the resistance of certain sorts derived from the crosses Hajira × Joanette, Hajira × Banner, and Victoria × (Hajira × Banner).

Ear tipping in wheat, G. D. H. BELL (*Agriculture, Jour. Min. Agr. [Gt. Brit.], 51 (1944), No. 7, pp. 318-320, illus. 3*).—A note on white and shriveled tips and upper parts of wheat ears attributed to low temperatures at the critical time of flower development prior to grain setting.

Effect of scab on the quality of hard red spring wheat, P. P. MERRITT and E. R. AUSEMUS. (Minn. Expt. Sta. and U. S. D. A.). (*Cereal Chem., 21 (1944), No. 3, pp. 199-209, illus. 1*).—In a study of *Gibberella zeae* infection of four hard red spring wheat varieties (Thatcher, Regent, Ns 2829, and Ns 2822), the weight per 1,000 kernels was markedly lowered and their apparent specific gravity was also decreased. The yield of flour from scabby wheat was slightly but significantly decreased by scab, its ash and reducing sugar contents were somewhat higher, and its carotenoid pigment was considerably higher as compared with corresponding flours milled from sound wheat. Differential baking tests representing sound and scabby Thatcher and Ns 2829 showed that the absorption at mixing time and the oxidation, mixing, and fermentation requirements of the flours from sound and scabby wheat were essentially similar. Doughs made with flours from the scab-infected wheats had wet sticky surfaces, collapsed readily, and markedly decreased in consistency as fermentation progressed. These doughs produced bread with darker crust and duller, more yellow crumb color than corresponding doughs made with flours from sound wheat; they also exhibited a characteristic tendency to "cup" or pull away from the bottom of the baking pan. These undesirable baking properties were greatly minimized when such flours were blended with those from sound wheat. The loaf volumes of blends containing up to 30 percent of flour from scabby wheat compared favorably with those of flours milled from sound wheat.

Leafroll vs. yield of "second crop" potatoes on Long Island, H. S. CUNNINGHAM. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, pp. 11, 13*).—The production of a crop of potatoes in the fall for use as seed for the following season is practiced by many growers on Long Island. Preliminary tests indicated that use of such seed—even with leaf roll—does not seem to reduce yields seriously as compared with crops from northern-grown seed.

The effect of latent mosaic (virus X) on yield of potatoes in Maine, E. S. SCHULTZ and R. BONDE. (U. S. D. A. and Maine Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 10, pp. 278-283*).—This virus is harbored more generally than any other by most of the old and some of the new potato varieties—by some without inducing symptoms and by others with typical mosaic. Latent mosaic is caused by several strains of virus X, distinguishable by the severity of host reactions; besides inducing more severe foliage symptoms, the stronger strains depress the yield more than the weak ones. It was shown that this disease reduces yields by 9–22 percent, that they are depressed more in some varieties than in others, and that annual losses of millions of bushels result. The control measures indicated involve propagation of seed potatoes in isolated fields, protective inoculation with a weak virus strain, and development of immune varieties.

Potato wart in Pennsylvania, R. E. Hartman (*Pa. Acad. Sci. Proc., 17 (1943), pp. 71–77, illus. 2*).—A presentation of the recent situation in this State with respect to the wart disease in relation to quarantines, surveys, and research, including eradication investigations.

Standardization of root excretions for immunity trials on the potato root eelworm, C. Ellenby (*Nature [London], 154 (1944), No. 3907, pp. 363–364*).—Experiments with South American species of potato—carried on since 1941—are reported to have shown that, as compared with British species, they are generally far less strongly attacked by the potato eelworm, nor do their root excretions stimulate to the same extent the emergence of larvae from the cysts. A full account of this work is to be published later, but at this time the method recently developed to test whether the differences in excretions were truly specific, is described in detail with the idea that it might prove useful in other fields of eelworm research. In this procedure the oxygen consumption of the roots is used for standardizing the solutions of root excretions, the assumption being that the rate of production of the latter is related to the metabolic rate. Other activities, such as growth hormone production, might similarly be used, but this method seemed to be particularly suitable, since it can be done reasonably accurately and rapidly—the actual determination requiring little more than 5 min.

Effects of iron deficiency on respiration of sunflower plants, P. R. Glenister (*Bot. Gaz., 106 (1944), No. 1, pp. 33–40, illus. 10*).—Among sunflower plants grown in sand culture solution, one group had ferric citrate added and the other no Fe salt. Plants of the minus-Fe group developed the typical Fe-deficiency chlorosis; the controls were normal in color. In the young chlorotic leaves of Fe-deficient plants respiration was repressed and there was only half as much Fe as in comparable leaves of controls. No relocation of Fe from older to younger leaves occurred in the Fe-deficient plants; in both, the gradients were of decreasing Fe content in proceeding from bottom to top of the plants. The Fe contents of the leaves of a given plant under either treatment were found related to the ages of the leaves, the older ones containing more Fe than the younger.

Foliage infection of Lycopersicon esculentum by Colletotrichum phomoides, S. G. Younkin and A. W. Dimock. (Cornell Univ. et al.). (*Phytopathology, 34 (1944), No. 11, pp. 976–977, illus. 1*).—Seedling Rutgers, Marglobe, Early Baltimore, Chicago, and Garden State tomato plants that has been atomized with spore suspensions of *C. phomoides* and held 1.5–3 days in a saturated atmosphere developed numerous small necrotic spots on the leaves and cotyledons; lesions appeared 5–7 days after inoculation. Sporulation of the fungus on infected tissue was observed microscopically; isolations from surface-disinfested lesions yielded only this fungus.

Tomato leaf rolling (*New Jersey Stas. Plant Disease Notes, 21 (1944), No. 11, pp. 41–44*).—On a rolling upward and inward of the individual leaflets of the older leaves, nonparasitic in origin and caused by certain unfavorable fluctuations in growth conditions. Ordinarily no specific control measures are needed; if extremely severe, some of the suggested points to be considered are liberal applications of organic matter, subsoil drainage, liming, and avoidance of severe root pruning on large plants by too deep or too close cultivation just before a dry period.

The ring rot bacterium in relation to tomato and eggplant, R. H. LARSON. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 8, pp. 309–325, illus. 8.*—It is demonstrated that *Corynebacterium sepedonicum* may readily cause severe wilting and death of tomato plants, and detailed histological and reisolation studies have shown that it invades the tissues systemically through the xylem but rarely affects the adjacent phloem and parenchyma in the initial invasion stages. The intercellular spaces of younger xylem tissues exhibit only slight enzymatic action in advance of the bacteria; lignification and sclereid formation were not observed. In infected mature fruit the bacteria can be traced from the invaded place of fruit attachment through the tracheae in the placental region and locular cavity directly to the funiculus of the seed; there the bacteria were identified between the integument and endosperm in the micropylar region between embryo and endosperm; seed transmission was demonstrated. All varieties tested were' susceptible, though some differences in tolerance were observed. Infection occurred in all tomato transplants to soil recently infested with bacterial suspensions; no infection resulted from planting tomatoes in inoculated soil that had overwintered in the field. All varieties of the common garden eggplant proved susceptible, as was also the annual weed, scarlet eggplant (*Solanum integrifolium*). Puerto Rican Beauty and selection E-12 —two varieties of eggplant resistant to *Bacterium solanacearum*—were also resistant to *C. sepedonicum.*

Comparison of soil fumigants for the control of the root-knot nematode, F. L. STARK, JR., B. LEAR, and A. G. NEWHALL. (Cornell Univ.). (*Phytopathology, 34* (*1944*), *No. 11, pp. 954–965, illus. 3*).—In tests of several soil fumigants against *Heterodera marioni* in two commercial tomato greenhouses, control was measured by comparing yields and by scoring all roots on several series of replicated plots. When injected 4–5 in. deep on 10-in. centers, good control was obtained with chloropicrin at 1.6, 2, and 2.5 cc. per injection, chloropicrin plus ethylene dichloride (1–9) at 7.35 and 10 cc., chloropicrin plus methyl bromide (3–1) at 1.8 and 2.0 cc., D–D mixture at 4 cc., ethylene dichloride at 15 cc., and methyl bromide mixture (10 percent methyl bromide in a 3–1 mixture of ethylene dichloride and carbon tetrachloride) at 3, 4, 5, 6, 7, and 8 cc. per injection. Furyl-nitroethylene dust at 20 lb. per 1,000 sq. ft. failed to control root knot. The advantages and disadvantages of each fumigant are discussed and data on economic return presented.

Increasing the dosage of chloropicrin above 1.6 cc. and of the 10 percent methyl bromide mixture above 3 cc. per injection failed to give larger yields, even though more complete control of nematodes was obtained. Increased yields from the treated plots were due to the production of more rather than larger tomato fruits.

Fruit disease control, H. C. YOUNG. (Ohio Expt. Sta.). (*S. Dak. State Hort. Soc., Ann. Rpt., 41* (*1944*), *pp. 53–54*).—A note on plant disease history in Ohio.

An outbreak of fire-blight follows previous dry summer and open winter as in past, M. A. BLAKE (*Hort. News* [*N. J. State Hort. Soc.*], *25* (*1944*), *No. 5, pp. 1618, 1620*).—On an outbreak of infection of pome fruit trees by *Erwinia amylovora* in New Jersey, summer of 1944.

Relative fire-blight injury of 117 varieties of apples, R. SAGER (*Hort. News* [*N. J. State Hort. Soc.*], *25* (*1944*), *No. 5, p. 1619*).—Among the 117 varieties in the Rutgers University orchard, fire blight is said to have developed on 64—all from blossom infection. The data are tabulated, listed, and briefly discussed with respect to degrees of injury encountered among the varieties attacked.

The eradication of black spot or apple scab in Western Australia, H. R. POWELL and W. P. CASS SMITH (*Jour. Dept. Agr. West. Austral., 2. ser., 21* (*1944*), *No. 2, pp. 148–155, illus. 5*).—Apple scab "appears to be present in all apple growing countries of the world, with the exception of Western Australia, which is now believed to be free. . . . The latest outbreaks occurred in the season of 1939–40, and these were more serious than any of the previous ones." The authors describe that outbreak and the eradication measures used and discuss the danger of a future outbreak, with the conclusion that "in the light of past experience . . . it can also be eradicated." As to the methods used, all visibly infected leaves and fruit were removed and destroyed. The trees in and around the infected area and the ground beneath were sprayed with bordeaux at once—also after harvest—and a cover crop was planted to catch fallen leaves and prevent them from blowing. Just before the winter buds burst, the cover crop and fallen leaves were buried by deep ploughing. Fallen leaves caught along fences and in uncleared areas were destroyed by flame throwers. Bordeaux was applied three times in the spring. This program was enforced in each infected orchard until free from visible scab for two full growing seasons. Leaves attached to imported nursery stock—evidently a source of earlier outbreaks—are now required to be removed before shipment, and the trees are treated with bordaux before leaving the inspection sheds.

Fermate, a promising new fungicide for apple spraying (*New Jersey Stas. Plant Disease Notes, 21 (1944), No. 12, pp. 45–48*).—On the basis of 1942–43 tests it seems that Fermate used during the first 2–3 cover sprays would strengthen the spray program, since it has protected against both late scab and early fruit spot (*Phoma pomi*) infections without the danger of injury inherent in the oil-sulfur sprays. It also appears that Fermate can be used throughout the blooming and early cover spray period without much danger from fruit russeting such as follows application of the copper fungicides.

Can storage scald disease on apples be controlled? R. M. SMOCK. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, pp. 10, 16, illus. 2*).—Present results of studies still in progress indicate great promise from conditioning the air in controlled-atmosphere storage by activated charcoal treated with a small amount of bromine; even in ordinary cold storage the method has given results superior to those from use of oiled paper in 1 year's tests. Storing scald-susceptible varieties separately or treating them with a coating of wax emulsion also aided in preventing development of this physiological disorder.

Two years' observations on the causes of "sick" peach trees, I. C. HAUT. (Univ. Md.). (*Md. State Hort. Soc. Proc., 46 (1944), pp. 16–23*).—This is a report of a special survey of peach troubles in Maryland. No evidence was found of any widespread dissemination of the newer virus diseases and no more than occasional cases of yellows and little peach except in a few semiabandoned orchards. Most of the peach tree losses—in some instances of serious proportions—were found due to culture problems; some of these involved overdeep planting, poor handling of terraces, too close planting, malnutrition, and poor cover crop management on shallow soils and in relation to drought. Failure to control damage by borers and mice were also involved. These factors are briefly discussed.

Intercellular mycelium of Taphrina deformans in peach fruit, C. ROBERTS and J. T. BARRETT. (Univ. Calif.). (*Phytopathology, 34 (1944), No. 11, pp. 977–979, illus. 1*).—Abundant mycelium was observed in immature peach fruits with discolored slightly raised lesions but not ordinarily in those with warty protuberances. Intermediate symptoms on some fruits precluded the possibility of a definite correlation between symptomatology and presence of the fungus. It is believed that symptomatology alone is not a justifiable basis for assuming fruit infection by *T. deformans*.

"Stunt" disease of blueberries, R. F. SUIT. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, p. 16, illus. 1*).—The results of a study of the prevalence of this virus disease in two blueberry plantings on muck soil indicate it to be of major importance, practically eliminating a planting in a few years if not controlled. Roguing should help in eliminating the disease, and preliminary tests indicate that removal of affected branches during summer may also aid in control. Definite symptoms have not been found in wild blueberries.

Diseases of the raspberry, G. H. BERKELEY and G. C. CHAMBERLAIN (*Canada Dept. Agr., Farmers' Bul. 123, rev. (1944), pp. 11, illus. 10*).—An informatory leaflet on virus, fungus, bacterial, and nonparasitic diseases and their control.

Histórico de Elsinoë ampelina, o fungo causador da antracnose da videira, A. E. JENKINS and A. A. BITANCOURT (*Biológico, 10 (1944), No. 4, pp. 109–114; Eng. abs., p. 112*).—A survey (40 references) of the history of the grape anthracnose in South America revealed that in Chile, Brazil, Paraguay, and Argentina there are independent records of the disease beginning with 1877, in which year Lefeuvre diagnosed it in southern Chile. Other early papers by this and other authors were published in Chile in 1878 and 1880; these are the earliest known records for any of the South American countries. In Brazil the disease was first reported by Goeldi in 1888, and in 1910 Puttemans stated that he considered it the worst malady of European grapes in that country. Between those two dates anthranose was studied in São Paulo by Campos Novaes and by Noack. The report of the disease from Paraguay in 1886 was by Spegazzini, who found it there in 1881. In Argentina, Peru, and Venezuela records of the disease date from 1896, 1901, and 1934, respectively.

Diseases of the papaw, E. W. B. DA COSTA (*Queensland Agr. Jour., 58 (1944), No. 5, pp. 282–293, illus. 10*).—Information is presented on the diseases (with key) affecting the plant as a whole and those affecting chiefly the fruit, with control measures.

Growing bananas on acid soil, G. D. SCARSETH (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 10, pp. 188–189, 194–195, illus. 5*).—In this first published report of experiments on the control of Panama disease (*Fusarium bulbigenum cubense*) of Gros Michel bananas in acid soils on old infested land, the following suggestions are offered on the basis of the results obtained: Select a soil area that is clay in texture; start by killing the diseased host plants 10–12 yr. ahead of the other operations, although an effective soil disinfection reagent may shorten this to 1 yr.; apply hydrated lime, 12–15 tons per acre, to obtain a pH of 7.5 to a depth of 16–24 in., depending on the pH of the original soil; fertilize heavily with phosphate and potash and seed to legume cover crop; and plow under several of these legume crops for a period of 1 yr. or more before replanting to bananas. As a result of these investigations it is expected that production of this great tropical food crop can be brought back to certain abandoned areas and continued on a permanent basis. The treatment of the soil for controlling the disease makes it so fertile that the yield and quality of fruit are greatly increased.

Witches' broom disease investigations, VIII-XI, R. E. D. BAKER and W. T. DALE (*Trop. Agr. [Trinidad], 21 (1944), Nos. 9, pp. 170–176, illus. 2; 10, pp. 196–199*).—A continuation (E. S. R., 90, p. 653).

VIII. *Observations on fan broom formation and loss of pods at River Estate from September 1942 to September 1943* (pp. 170–175).—Up to the time of writing—the fourth year of serious attack—the cacao trees themselves had been only slightly damaged by the disease and their yielding capacity was virtually unimpaired; it is believed possible that a fan broom, which has plenty of leaves and chlorophyll, might be practically self-supporting as far as carbohydrates are concerned and would withdaw only small quantities of minerals from the tree. The results have given no reason to suppose that trees of this kind of seedling cacao have any resistance to pod attack; however, trees which set the bulk of their crop in the dry season showed considerable disease avoidance. Thus if a clone setting its main crop at this time of year could be found, its use might go far towards the economic control of the disease, especially if such a clone exhibited resistance to fan brooms and was not a free-flowering type which could be severely damaged by cushion brooms.

IX. *Loss of pods at River Estate—results to April 1944* (pp. 175–176).—Yield records are tabulated and briefly discussed. No reason was found to believe that trees in this plot exhibited any resistance to the disease.

X. *Loss of pods in I. C. S. clones at River Estate during 1943* (pp. 196–198).—Several clones are reported to have given some promise of pod resistance in addition to disease avoidance; until further substantiated, however, these results must be viewed with caution.

XI. *Observations on the effect of planting interval on witches' broom disease at River Estate* (pp. 198–199).—The findings here reported fail, on the whole, to support the theory that close-planted cacao has fewer pods attacked by witches'-broom, but the fact remains that the closer spacings not only appeared to be in better condition but were producing far more cacao than the wider spacings.

Um teste para a identificação precoce da tristeza dos citrus (A test for the early identification of the "tristeza" disease of citrus), A. A. Bitancourt (*Biológico, 10 (1944), No. 6, pp. 169–175; Eng. abs., p. 175*).—The test consists in applying a 3-percent alcoholic solution of iodine to the superficially scraped bark at the bud union. On affected trees a marked contrast is shown between the starch-full dark-colored parenchyma of the sweet orange scion and the colorless parenchyma of the sour orange stock; this reaction is reversed on the inner surface (phloem) of the bark. The more pronounced the external symptoms of disease, the more acute is the contrast in color at the bud union. Apparently healthy trees in affected orchards may exhibit a faint reaction, indicating that the disease is present even though the foliage symptoms have not yet developed. Tests made at Riverside, Calif., where the disease does not occur, were consistently negative. The apparent lack of carbohydrate translocation in the phloem from the sweet orange top to the sour orange roots explains the death of the rootlets and subsequently that of the trees; it also supports the theory presented by the author that the disease is caused by a virus latent in the sweet orange and to which the sour is immune. The symptoms—including the accumulation of starch in the bark and the death of the starved rootlets—parallel those described by W. P. Raleigh in his experiments on grafting scions with latent potato mosaic on healthy seedlings known to be resistant (E. S. R., 76, p. 493).

Fungistatic action of diphenyl on citrus fruit pathogens, G. B. Ramsey, M. A. Smith, and B. C. Heiberg. (U. S. D. A. et al.). (*Bot. Gaz., 106 (1944), No. 1, pp. 74–83, illus. 3*).—Among the 10 pathogens studied, growth of a few was totally inhibited, some were moderately or only slightly checked, and 1 appeared to be stimulated by diphenyl; differences in responses were also observed when spores placed in water drops and on agar plates were exposed to its vapor. For all fungi so exposed, the developing hyphae were larger in diameter than normal and secondary branching was greatly increased. With some fungus species there was a tendency to produce short malformed or giant cells. Spores frequently became enlarged and distorted and often burst before the germ tubes were appreciably developed; death of cells did not occur except on actual bursting. On removal of diphenyl from cultures the organisms resumed growth and spore production. A new method of using diphenyl as a fungistatic agent for controlling citrus fruit decay was demonstrated: Unwrapped oranges placed in cuplike depressions in special paper-pulp trays impregnated with diphenyl developed little or no decay when packed in tight fiberboard boxes; controls developed considerable rot. Control of fruit rot during transit, storage, and marketing through use of diphenyl-treated wraps or trays results from inhibition of germination in surface spores, retardation of growth in exposed hyphae, and prevention of new spore formation—often the source of infections during handling. Diphenyl vapors should prove effective in checking development of blue mold rot, *Botrytis* rot, *Diplodia* and *Phomopsis* stem-end rots, and green mold rot; its failure to markedly inhibit mycelial growth and spore germination of the fungi of *Alternaria* rot, anthracnose, *Phytophthora* brown rot, *Sclerotinia* cottony rot, and *Trichoderma* rot suggests that these diseases are unlikely to be controlled in this way.

Experimental control of orange decays with thiourea, J. F. L. Childs and E. A. Siegler. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 11, pp. 983–985*).—Effective control was obtained for stem-end rot (*Diplodia natalensis* and *Phomopsis citri*) and green mold (*Penicillium digitatum*) on Pineapple, Temple, Valencia, and seedling-type oranges held in storage 2–3 weeks at about 70° F. Momentary dipping of 225 oranges in 5 percent thiourea plus 0.05 percent of the wetting agent Vatsol resulted in 1.8 percent fruits with decay; of 222 untreated fruits, 38.2 percent decayed. This treatment proved equally effective on fruits previously exposed to ethylene and when a wax emulsion was incorporated therein. Fruits washed immediately after treatment gave 19 percent decay, but if air dried before washing no decay appeared; 44.6 percent of the control untreated fruits decayed.

Guayule nursery diseases and their control, A. J. Braun, W. A. Campbell, J. T. Presley, H. Schneider, B. Sleeth, L. Weston, et al. (*U. S. Dept. Agr., Bur. Plant Indus., Soils, and Agr. Engin., 1944, pp. 20+, illus. 7*).—"The purpose of this report is to summarize the present information on guayule nursery diseases and their control. This information is still incomplete, and more detailed knowledge must await the outcome of greenhouse and field experiments and further observations."

Science's fight for healthy Hevea, M. H. Langford (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 8, pp. 151–153, 158, illus. 5*).—An account of the cooperative research program begun in 1940 for control of the South American leaf blight of the Para rubbertree caused by the fungus *Dothidiella ulei*. As a result of this work, the feasibility of preserving valuable breeding trees by fungicidal spraying has been demonstrated, and many high-yielding resistant clones have been selected and increased until the use of thoroughly tested material in mixed field plantings and for top-budding high-yielding Oriental clones has now become standard procedure. "As a result of the use of these modern-day pathological and horticultural procedures, which have been used extensively for other crops, science has provided a way for growing healthy high-yielding hevea rubbertrees in tropical America."

Remedy found for chlorosis of the azalea, R. A. Bowden. (Univ. Ga.). (*South. Florist and Nurseryman, 57 (1944), No. 18, pp. 8, 10, illus. 4*).—Tests of all known plant food elements indicated iron to be the controlling agent for this chlorosis, and $FeSO_4$ was the only form giving beneficial results. Plants suffering from chlorosis usually responded to spraying with $FeSO_4$ within 7–10 days, with the trouble cleared up within 14 days. Azaleas proved more susceptible under lack of moisture, in heavy soils, and with insufficient plant food materials available; proper pH conduced to a healthy condition, but soil reaction showed no connection with the cause or control of the trouble.

Hot-water treatment for control of Phytophthora root rot of calla, A. W. Dimock and K. F. Baker. (Cornell and Calif. Univs.). (*Phytopathology, 34 (1944), No. 11,, pp. 979–981, illus. 1*).—*P. richardiae* root rot of *Zantedeschia* sp. was controlled by treating infected rhizomes in water at 122° F. for 1 hr. and planting in sterilized soil in sterilized containers.

Streak and mosaic of cineraria, L. K. JONES. (Wash. Expt. Sta.). (*Phytopathology, 34 (1944), No. 11, pp. 941–953, illus. 4*).—Viruses of streak and mosaic have been destructive on cineraria in greenhouses of Washington State. Leaf and stem necrosis and wilting of plants near blossoming time by the streak virus often resulted in a loss of 20–50 percent of the plants. Leaf mottling, puckering, and malformation and dwarfing of plants by the mosaic virus in a few cases resulted in loss of a low percentage of the plants. The streak virus was transmitted by seed, mechanical rubbing of diseased on healthy tissues, and by *Thrips tabaci,* but was inactivated very quickly in extracted plant juice; it was transmitted to tomato and pea, the symptoms produced on these suscepts as well as the other characters of the virus indicating it to be a strain of the tomato spotted wilt virus. The mosaic virus was transmitted by seed, mechanical inoculation methods, and by *Aphis marutae,* was inactivated near 70° C., and remained active in extracted plant juice for 14 days; it was not transmitted to tobacco, tomato, cucumber, lettuce, or pea, and appears to be specific to cineraria. Streak and mosaic can be controlled by carefully selecting disease-free plants for seed production. Control of aphids and thrips on cineraria plants would also aid in reducing their spread. Destruction of possible weed hosts of the streak virus in the vicinity of cineraria plants and care to avoid handling of diseased before healthy plants are cultural practices of value in reducing losses.

The use of fungicides and growth substances in the control of Fusarium scale rot of lilies, W. D. MCCLELLAN and N. W. STUART. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 11, pp. 965–975, illus. 3*).—Bulb scales of two *Lilium longiflorum* clons and scales of *L. testaceum*—all known to be very susceptible to rot by *F. oxysporum* f. *lilii*—and scales of a mixture of less susceptible Easter lily clons were treated with some or all of the following fungicides: Ceresan, Arasan, Fermate, Zincate, Spergon, and formaldehyde. The scales were examined for 4–6 weeks after planting on a greenhouse bench under moist sphagnum. Very good protection was obtained with Spergon and Arasan, the latter proving superior on the very susceptible scales; these two materials also stimulated production of roots, bulblets, and shoots. Fermate and Zincate were relatively ineffective, and formaldehyde injured the scales. Good protection was obtained with Ceresan, but bulblet production was inhibited; when Arasan followed the Ceresan treatment this difficulty was overcome, but Spergon did not have this effect. Use of Arasan and Spergon as carriers for the growth substances—indolebutyric and naphthaleneacetic acids—at 5,000 to 1 resulted in heavier rooting than with either alone. Under the test conditions Arasan was superior to Spergon and naphthaleneacetic acid to indolebutyric acid.

A canker and some decay fungi on mimosa, M. E. FOWLER and J. A. STEVENSON. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 11, pp. 985–987, illus. 1*).—In addition to other wood-rotting fungi, *Nectria cinnabarina* was found associated with cankers on twigs and branches of *Albizzia julibrissin* in Washington, D. C.

Susceptibility to white pine blister rust of Ribes cereum and some other Ribes associated with sugar pine in California, J. W. KIMMEY and J. L. MIELKE. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 10, pp. 752–756*).—The results obtained under the experimental conditions (1942) and comparisons with other tests of western United States *Ribes* plants indicate that the Sequoia form of *R. cereum* may be tentatively rated as low in susceptibility—though higher than the Lassen Park form, which in turn is somewhat more susceptible than the resistant forms of this species tested in Feather River Meadows and in British Columbia and Oregon. Both the Sequoia and Lassen Park forms must, however, be considered capable of producing appreciable amounts of pine-infecting sporidia when occurring in heavy concentrations under the most favorable conditions for infection. *R.*

tularense is tentatively classed as medium in susceptibility and telium-producing capacity, with telium production late in the season; *R. montigenum* is similarly classed, though somewhat lower in the scale. *R. roezli* is highly variable in northern California; its average susceptibility was found lower and its telium-producing capacity much higher than previously reported from tests on plants transplanted in British Columbia, though some individuals tested have exhibited very high susceptibility. Tests of transplanted and potted plants of this species from the southern Sierras conducted in British Columbia, Oregon, and northern California show that its southern race is more susceptible than the northern one.

Ação bacteriostática da "orelha de pau" vermelha (Polyporus cinnabarinus) [Bacteriostatic action of the wood-rotting fungus P. cinnabarinus], J. R. Meyer (*Biológico, 10 (1944), No. 6, pp. 165–168, illus. 5; Eng. abs., p. 168*).—The author reports the finding of a nontoxic bacteriostatic substance in the tissues of this fungus proving to be active against *Staphylococcus, Streptococcus,* and *Pasteurella.* It was readily soluble in water and maintained its activity when kept for several weeks at room temperature or after boiling for 5 hr.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Studies in economic zoology and entomology] (*Utah Acad. Sci., Arts, and Letters, Proc., 19–20 (1941–42—1942–43), pp. 9–10, 10, 11, 16–17, 23–24, 24–25, 89, 91, 93–108, 153–156, 173–178, 189–198, illus. 1*).—The following abstracts and/or papers are included: Some Insect Food of Sparrows, by G. F. Knowlton (pp. 23–24) (Utah Expt. Sta.); Notes on the Synonymy and Distribution of the Horned Larks of Utah, by W. H. Behle (pp. 153–156); Sex-Ratio Equations and Formulas for Determining Wildlife Populations, by G. H. Kelker (pp. 189–198) (Utah State Agr. Col.); Grasshopper Control in Utah, 1940–1941, by G. F. Knowlton (p. 9); Some Grass Infesting Utah Aphids, by G. F. Knowlton and W. D. Fronk (pp. 9–10), and The Genus *Phoetaliotes* (Orthoptera) in Utah, by W. W. Henderson (pp. 10, 93–97) (all Utah Sta.); Returns From Marked Snakes, by A. M. Woodbury and H. W. Setzer (p. 11); The Genus *Schistocerca* in Utah (Orthoptera—Locustidae—Cyrtacanthacrinae), by W. W. Henderson (pp. 16, 99–103) (Utah State Agr. Col.); Utah House Flies, by D. T. Jones (pp. 16–17, 105–108); Utah Bird Predators of the Beet Leafhopper, by G. F. Knowlton (p. 17) (Utah Sta.); More Utah Siphonaptera, by J. S. Stanford (pp. 17, 173–178) (Utah State Agr. Col.); Summer Habitats of the Winter House-Fly [Cluster Fly] (*Pollenia rudis*), by D. T. Jones (pp. 24–25, 91); and Mormon Cricket Control in Utah, by G. F. Knowlton (p. 89).

A summary of Pennsylvania Game Commission research activities, 1938–1942, A. T. Studholme (*Pa. Acad. Sci. Proc., 17 (1943), pp. 94–100*).—Includes the various projects on specific mammals and birds and miscellaneous work such as that on the banding and tagging program, operation of controlled shooting areas, winter feeding experiments with birds and mammals, forest wildlife problems, and the propagation and nutrition of game birds.

Mutual interests of wildlife conservation and malaria control on impounded waters, A. H. Wiebe and A. D. Hess (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 275–283, illus. 1*).—Experiences of the Tennessee Valley Authority during the past 5 yr. on the relations between malaria control and wildlife conservation on impounded waters indicate that many of the conflicts are apparent rather than real; actually the two fields have several mutual interests. The malarial control operations shown as beneficial to wildlife are reservoir clearance, marginal drainage, annual shore line conditioning, control of aquatic plants such as lotus, use of constant pool levels and minimized seasonal recession in schedules for management of water levels, establishment of diking and dewatering areas, restricting human populations on some areas, minimizing the use of larvicides, and promoting biological methods for controlling the common malaria mosquito. Wildlife conservation also has mutual interests with the over-all health program such as the control of stream pollution.

Estimating acorn crops for wild life in the southern Appalachians, A. A. DOWNS. (U. S. D. A.). (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 339–340*).

Supplemental winter feeding of mule deer in northern Utah, E. R. DOMAN and D. I. RASMUSSEN. (Utah State Agr. Col. et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 317–338, illus. 8*).—A review of records of supplemental winter feeding in various States revealed no method or diet that has proved entirely successful. Heavy winter losses are not normal in mule deer, as evidenced by the few losses where sufficient native forage is available. Various supplements tried on the North Logan feed ground failed to replace native forages successfully, though alfalfa seemed to be as satisfactory as any available substitute on ranges where there was a fairly good supply of even the less palatable forage species. The time limit for successful supplemental feeding is about 2 mo., as determined by repeated tests and study of weight losses in deer on a feed ground. Pen feeding tests with fawns showed that a diet solely of alfalfa hay is insufficient to maintain their weight, even for short periods. Diets of 60 percent alfalfa and 40 percent barley or "Purina" pellets prevented weight losses in penned deer over a 67-day feeding period. The more deer became dependent on supplemental feeds and less on native forage, the greater were the winter losses. The large death losses among deer during later winter and early spring on and adjacent to the feed grounds proved to result almost entirely from malnutrition. On the basis of observations during eight winters, climatic conditions were responsible for major losses only insofar as deep snows forced the animals to concentrate on limited winter ranges having insufficient forage. The entire policy of supplemental winter feeding for deer is considered impractical as a welfare program and also from the standpoints of finance and range management. Detailed recommendations on the basis of these findings are presented.

Summer movements of banded muskrats, M. J. TAKOS. (Univ. Maine et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 307–311, illus. 1*).—Of 107 muskrats banded in Maine—summer of 1941—40 were recaptured for a total of 184 times. Most of them tended to remain near the area where banded; all banded immatures were recovered within a 100-ft. radius. Most of the animals remained within a limited home range, though a few tended to occupy more extensive territory.

Additional studies on tagged young muskrats, P. L. ERRINGTON. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 300–306, illus. 2*).—In view of the evidence presented, the back-tagging method appeared—under Iowa conditions—to be highly effective when used only for marking muskrats 2–4 weeks old, the ages when often obtainable in large numbers from marsh lodges. The method is not recommended, however, for marking those over 4 weeks old. See also a previous note (E.S.R., 79, p. 501).

Role of ticks in decline of an insular cottontail population, R. H. SMITH and E. L. CHEATUM (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 311–317*).—Fishers Island, N. Y., was stocked with several dozen midwestern cottontails about 1925; ground predators being absent, overpopulation resulted and serious damage by 1938. Attempts at control by bounties and shooting were unsuccessful, but following moderate reduction by winter starvation (1940–41) a considerable mortality accompanied by tick infestation was reported in 1942. Investigation later (1943) showed a substantial mortality through parasitization of adults by *Ixodes dentatus* and to a lesser degree by *Haemaphysalis leporis-palustris.* Death was apparently caused by tick-induced anemia or by bacterial infections at points of tick attachment resulting in localized metastatic pyogenic infections of the lymph nodes. Juvenile losses occurred when nestlings were abandoned by sick or dying ♀♀ or when fatal infestations of ticks occurred after leaving the nests. The local pheasants were parasitized but not, insofar as known, killed by ticks; one muskrat, two gray squirrels, and a ground squirrel were free of ticks when examined.

Experimental feeding of captive fox squirrels, P. Baumgras (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 296–300*).—The poor quality of red oak acorns as food for *Sciurus niger* was shown by loss of weight or death with an exclusive diet thereon. This throws light on the observation that squirrels, as well as deer and raccoons, feed on white and black oak acorns but almost completely ignore those of red oak as long as supplies of the others are available. Obviously the white and black oaks should be given preference in selective cutting or planting for improvement of squirrel habitats. The value of white oak is further enhanced by its high rating as a den tree. Walnuts are important in squirrel management but secondary to the acorns as staple foods. Results with field corn were somewhat contradictory and further study is needed before conclusions can be drawn; in general, however, its use by squirrels is secondary to natural foods.

The ground squirrel problem in California, S. E. Piper and W. C. Jacobsen (*Spreckels Sugar Beet Bul., 8 (1944), No. 5, pp. 36–38, illus. 1*).—Among the 20 or more species in California the primary concern here is with the 7 which are destructive to range and pasture, field and truck crops, and fruit and nut trees and their products, as well as damaging to agricultural structures. Their depredation and the history and present status of organized control—with the methods used—are briefly discussed.

Sylvatic plague: A note on the finding of large numbers of fleas on ground squirrels (gophers) in Alberta, J. H. Brown (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 3, pp. 80–82*).—The rodents concerned were *Citellus richardsonii* and *C. columbianus.*

Some insect food of the chickadee, G. F. Knowlton. (Utah Expt. Sta.). (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 3, p. 85*).

Winter habits of crows in Oklahoma, S. E. Aldous (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 290–295, illus. 1*).—During the past 30 yr., crow populations have increased in the Oklahoma wintering areas because of more extensive agriculture both there and in the Canadian nesting areas; the favorable response to improved winter environment has thus more than offset the effects of control measures. Data are presented on their migration, factors conducive to large wintering concentrations, roost populations, utilization of their products, and their food. In central Oklahoma their diet in early fall consists largely of insects, wild fruits, early-maturing grain sorghums, and corn; during late fall and winter they consume late-maturing grain, that left in the field, or any that can be pilfered from corrals, hog lots, and feed stacks. In spring the food changes largely to spring oats and to insects exposed by soil preparation. About 72 percent of the birds taken from one roost were *Corvus brachyrynchos brachyrynchos* and the others *C. b. hesperus.*

Pheasant mortality and nesting success: Canton Center study area, January 1941 through June 1942, J. S. Bishop (*Conn. State Bd. Fisheries and Game, Pittman-Robertson Bul. 1 (1944), pp. 46, illus. 18*).—The primary aims of this project were to test the effectiveness of the present stocking and to seek improvements in the program which would increase the hunter bag. This involved knowledge of the production and length of life of pheasants in the field and all that affects these matters—either favorably or unfavorably. The nesting, nest success, hatch, and number of young brought to the hunting season shows what actually is being produced. This production is controlled by mortality, and the reasons for high and low productivity lie in the amounts, seasons, and causes of loss as they affect native and various stocked birds. All this information sought was considered necessary in deciding the comparative value of native and stocked birds and of birds stocked at various times of the year, in furnishing hunting season bag. The study was carried out on an area considered typical for Connecticut, and the detailed results are presented in text and tables and are fully discussed. There are numerous factors of loss and production which should be further investigated. Curtailment of funds, "due to the war, makes necessary the presentation of this program without the complete basis of fact and test demonstration which would otherwise be attempted."

Damage to corn by red-wings, H. A. CARDINELL and D. W. HAYNE (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 26–34, illus. 4*).—Red-winged blackbirds damage corn in some parts of Michigan; such injury may be expected at any time after the silk is dry. Severe damage is preceded by at least a few days at a lower rate, thus giving opportunity for protection. The exact areas in which damage occurs may shift from year to year. Nothing is gained by early harvesting, since any gains from proper maturing equal or exceed the losses from birds. Protection by shotgun patrol is considered too costly at prevailing labor costs. An automatic exploder, however, is said to be efficient and has not been observed to deteriorate with use; protection by rags hung in the field is less effective and for shorter periods but is also less expensive. Both these methods appeared to increase in efficiency after a few days use.

Status of eelgrass in Massachusetts during 1943, C. E. ADDY and D. A. AYLWARD (*Jour. Wildlife Mangt., 8 (1944), No. 4, pp. 269–275, illus. 1*).—A reconnaissance during 1943 indicated *Zostera marina* to be returning in substantial amounts at many points along the Massachusetts coast and to have steadily increased during the preceding 4 yr.; it was not, however, as abundant anywhere as before 1930. The *Labyrinthula* associated with the eelgrass disease was still present. Canada geese, sea brant, and black ducks were observed on beds of eelgrass; the first two fed almost entirely thereon, and the sizable beds on Cape Cod are believed to have contributed materially to keeping these birds there during the winter. Success was achieved in transplanting eelgrass by removing soil with roots; seeds and roots were also harvested for storage and immediate planting, but these experiments are preliminary and incomplete. A footnote states that since submission of the paper the eelgrass in this region has shown widespread blackening and degeneration characteristic of the disease; the effects on the health and survival of the present beds are being investigated.

Some predators of the Flintville State Fish Hatchery, G. GENTRY (*Jour. Tenn. Acad. Sci., 19 (1944), No. 3, pp. 265–267*).—The total list of predators killed and examined in 1943 at this Tennessee hatchery included green herons, pied-billed grebes, kingfishers, killdeer, and water snakes. Not only do bird predators destroy fish, but they also bring in some fish parasites; some of the insects which the birds had taken as food are also regarded as predators on small fish.

Fish stocking as related to the management of inland waters, M. C. JAMES, O. L. MEEHEAN, and E. J. DOUGLASS (*U. S. Dept. Int., Fish and Wildlife Serv., Conserv. Bul. 35 (1944), pp. 22+, illus. 9*).—To promote a better understanding of where stocking is applicable and the reasons for designating certain numbers and species of fishes for certain waters, the authors give descriptions of habitats and the part that stocking plays in the management program, together with further pertinent information.

[Notes on insects and insecticides] (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 537–562, illus. 9*).—Contributions presented (E. S. R., 92, p. 81) are DDT as a Contact Poison for Honeybees, by R. S. Filmer and C. L. Smith (p. 537), Field Tests of DDT To Control the Peachtree Borer, by B. F. Driggers and C. L. Smith (p. 537), and Toxicity of DDT to *Macrocentrus ancylivorus* Rohwer, by C. L. Smith and B. F. Driggers (p. 538) (all N. J. Expt. Stas.); A Positive Feeding Device for

Application of Dust Mixtures, by T. E. Bronson and J. E. Dudley, Jr. (pp. 538–539) (U. S. D. A. coop. Wis. Sta.); Fumigation With Methyl Bromide for Potato Tuber Worm, by H. G. Walker and L. D. Anderson (pp. 539–540) (Va. Truck Sta.); Winter Distribution of Two Ectoparasites of the Cottontail Rabbit in Missouri, by R. W. Portman (p. 541) (Univ. Mo.); *Acerophagus notativentris,* an Important Parasite of the Grape Mealybug, by S. E. Flanders (p. 541); Toxicity Tests of Some Organic Compounds and Their Hydrogenated Derivatives Against Codling Moth Larvae, by E. H. Siegler, C. V. Bowen, and L. E. Smith (pp. 542–543) (U. S. D. A.); Differentiating the Larvae of *Uranotaenia* in the Southeast, by J. E. Pryor and R. W. Chamberlain (pp. 543–544); Feeding Experiments With the Range Caterpillar Egg Parasite *Anastatus semiflavidus* Gahan, by O. L. Barnes (pp. 544–545), and Economic Importance of Prolonged Pupal Periods of the Tobacco Hornworm, by F. S. Chamberlin (pp. 545–546) (both U. S. D. A.); Some Parasites of the Sweetpotato Weevil, by K. L. Cockerham (pp. 546–547) (U. S. D. A. coop. La. Sta. et al.); A Mixture of Pyridine and Iso-amyl Alcohol Attractive to Some Species of *Blepharoneura,* by D. F. Starr (p. 547) (U. S. D. A.); Distribution and Prevalence of the Mosquitoes of Kentucky, by G. E. Quinby, R. F. Serfling, and J. K. Neel (pp. 547–550); The Poisoning of Bees, With Methods of Prevention, by J. E. Eckert (pp. 551–552) (Univ. Calif.); An Electrically Regulated Humidity Control, by C. H. Brett (pp. 552–553) (Okla. A. and M. Col.); An Adaptation of a Thermograph To Regulate Variable Temperature, by F. Munger (pp. 554–555) (U. S. D. A.); An Anomalous *Anopheles quadrimaculatus* Larva From Louisiana, by W. F. Buren (p. 553); Additional Species of Mosquitoes Found in Texas, by K. O'Neill, L. J. Ogden, and D. E. Eyles (pp. 555–556); Tests With Synergists for Pyrethrum Against the Body Louse, by R. C. Bushland, G. W. Eddy, and E. F. Knipling (pp. 556–557) (U. S. D. A.); Residual Toxicity of Sulfur to the Potato Psyllid in Greenhouses, by H. D. Tate and R. E. Hill (pp. 557–558) (Nebr. Sta.); The Toxicity of DDT to *Adoretus sinicus* in Hawaii, by F. G. Holdaway and T. Nishida (pp. 558–559) (Hawaii Sta.); Obtaining Eggs of the Potato Tuber Worm for Use in the Mass Breeding of *Macrocentrus ancylivorus,* by P. H. Marvin (p. 560), and Residual Effect of DDT Sprays on Early Spring Apple Aphids, by L. F. Steiner (pp. 560–561) (both U. S. D. A.); Etherization and Refrigeration for Shipment of Insects, by H. S. Smith (p. 561), and Pyrethrum Marc for Control of Fall Cankerworm and Tussock Moth, by A. D. Borden and L. R. Jeppson (p. 562) (both Univ. Calif.); *Leucopoecila albofasciata,* a Pest of Golf Greens, by A. F. Satterthwait (p. 562) (U. S. D. A.); and The Tomato Russet Mite in Colorado, by J. L. Hoerner (p. 562) (Colo. Sta.).

On the growth of insect populations with successive generations, J Davidson (*Austral. Jour. Expt. Biol. and Med. Sci., 22 (1944), No. 2, pp. 95–103, illus. 5*).—Growth trends in natural populations of *Smynthurus viridis* L. (Collembola) and *Thrips imaginis* Bagnal are discussed to show the relation between the growth of insect populations with incomplete overlapping v. complete overlapping generations. In the latter, trends in population growth are best represented by a logistic curve; in some instances the growth trends may be cyclic because of generation effects or change of environal conditions. In the incompletely overlapping group the population growth exhibits a distinctive upward and downward trend in each generation, and the course of growth can be represented by combinations of normal or skew distribution curves which take into account the distribution of births and deaths in each generation. The extent of the overlapping of generations enlarges as the number of consecutive generations increases; complete overlapping is achieved in fewer generations with those species in which the female lays its eggs at frequent intervals over a large part of its adult life. The general trend of the growth of an insect population with overlapping generations can be described by a logistic curve, but it may not show the trend of the population within the periods of individual generations.

An entomologist looks at Costa Rica, P. KNIGHT (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 11, pp. 203–208, 217–218, illus. 3*).—This contribution contains observations on the more important insects in Costa Rica, with notes on climate, geography, and farming conditions.

Economic entomology in South America, E. J. HAMBLETON (*Sci. Mo., 59 (1944), No. 4, pp. 283–292, illus. 9*).—The paper gives brief consideration to South American entomological contributions, almost half of which until 1924 were devoted to taxonomy and medical entomology. During that and following years increasing emphasis began to be placed on the importance of crop plant pests; examples of such studies include investigations of the insect pests, particularly of coffee and cotton, and brief discussion of work with insecticides and control methods in general.

The scope and function of plant protection legislation in Ceylon with special reference to insect pests, B. A. BAPTIST (*Trop. Agr.* [*Ceylon*], *99 (1943), No. 4, pp. 221–230*).

Protection from insects, F. C. BISHOPP (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 10, pp. 183–185, 192–193, illus. 4*).—A discussion of insects and closely related animals harmful, annoying, or transmitting diseases to man, especially chiggers and ticks, fleas, mosquitoes, sand flies, blackflies, houseflies, and other flies such as blowflies, parasitic flies, and blood-sucking flies. Mention is made of some of the more practical controls.

Insect control in the victory garden, C. H. CURRAN (*Amer. Mus. Nat. Hist., Sci. Guide No. 117 (1943), pp. 32, illus. 30*).—A popular guide.

Quarterly bibliography on insecticide materials of vegetable origin, [Nos. 25 (October to December 1943) and 26 (January to March 1944)] (*Bul. Imp. Inst.* [*London*], *42 (1944), Nos. 1, pp. 39–44; 2, pp. 95–99*).—See also a previous note (E. S. R., 91, p. 566).

El piretro (Pyrethrum cinerariaefolium Trev.), un insecticida de gran valor [Pyrethrum—an insecticide of great value], P. PELLETIER CÁZARES (*Fitófilo, 3 (1944), No. 1, pp. 58–86, illus. 1*).—This general paper on ***Chrysanthemum cinerariaefolium*** considers its origin, classification, botanical description, climatic and soil requirements, propagation, culture, harvesting, yields, diseases and insect pests, purification, and applications.

Dispersants for rotenone: A study of the effect of dispersants on the toxicity of rotenone dusts, E. J. CAMPAU and H. F. WILSON. (Univ. Wis.). (*Soap and Sanit. Chem., 20 (1944), No. 10, pp. 117, 119, 121, illus. 1*).—During an extensive investigation of dispersants for rotenone and other insecticidal dusts it was found that the success of a dust treatment against the pea aphid depended to a large extent on the dispersant used, the most important factor apparently being closely related to particle size, shape, and hardness. In the tests reported, 15 different clays, 3 claylike materials, and a plant material were tested with dusts containing four different percentages of rotenone. Rather definite preliminary conclusions were drawn from this study: Effectiveness was correlated with even dispersion and good coverage. Except for celite and diatomaceous earth, the best coverage was obtained with dusts giving the lightest clouds, settling quickly, and becoming more evenly dispersed on plants and aphids. Dispersants with large particles up to 40µ gave better coverage and more even dispersion than those 2µ or less in diameter. The percentage of dispersant passing a 325-mesh sieve and its bulking value gave little indication of the amount of very fine particles actually present. An inverse relation apparently existed between the amount of hygroscopic moisture adsorbed by the dispersant and its effectiveness as a dust. Its H-ion concentration seemed to have no effect on the results with freshly mixed dusts. The electrostatic charge effects produced by different dusts indicated a relationship between size of charge and effectiveness of the dust; as a rule the higher the charge, the better was the dispersion and coverage.

The effect of plant dispersants on the toxicity of rotenone in ground cubé when used for pea aphid control, H. F. WILSON, E. J. CAMPAU, and R. L. JANES (*Soap and Sanit. Chem., 20 (1944), No. 10, p. 121, illus. 1*).—In the tests briefly reported, walnut-shell flour, various samples of lignin, and "Baggo," a plant material of unknown source, gave consistently better control than most mineral dispersants.

[Aerosol symposium] (*Soap and Sanit. Chem., 20 (1944), No. 7, pp. 107–111, 113, 115, 121, 135, illus. 2*).—The following papers are included: Aerosols Vs. Oil Spray Insecticides—a Study of Comparative Efficiency, by J. H. Fales and L. D. Goodhue (pp. 107–108) (U. S. D. A.); Liquefied Gas Aerosols—Postwar, by W. W. Rhodes (pp. 108–111); Aerosol Bombs Vs. Spray Insecticides, by R. O. Cowin (pp. 111, 113); Another View of Aerosol Efficiency, by N. J. Gothard (pp. 113, 115); and Pyrethrins for Aerosols—the Preparation of 98 Percent Pure Pyrethrins for Use in Freon Aerosol Bombs, by W. F. Barthel, H. L. Haller, and F. B. LaForge (pp. 121, 135) (U. S. D. A.).

[Papers on aerosols] (*Pests, 12 (1944), No. 9, pp. 8–24, illus. 2*).—The following are included (see also preceding entry): Aerosols Vs. Oil Spray Insecticides, by J. H. Fales and L. D. Goodhue (pp. 8, 10) (U. S. D. A.); Liquefied Gas Aerosols—Postwar, by W. W. Rhodes (pp. 12–18); Aerosol Bombs Vs. Spray Insecticides, by R. O. Cowin (pp. 18, 20); and Another View of Aerosol Efficiency, by N. J. Gothard (pp. 20, 22, 24).

Notes on dragonflies in the vicinity of New Smyrna Beach, Florida, M. WRIGHT. (U. S. D. A.). (*Fla. Ent., 27 (1944), No. 2, pp. 35–39*).

War against locusts in India, H. S. PRUTHI (*Cur. Sci. [India], 13 (1944), No. 7, pp. 174–176*).—A brief summary of the locust movements and breeding since September 1941, the control organizations of the government of India and of various provinces and States, and India's locust activities in other countries.

Adaptive importance of the first pair of legs of the mole-cricket Gryllotalpa gryllotalpa L., D. N. KOBAKHIDZE (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 7, pp. 318–320, illus. 1*).

Salivary secret[ion] of the aphis Myzus persicae Sulz. and its ability to form a filtering apparatus, K. S. SUKHOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 42 (1944), No. 5, pp. 226–228, illus. 1*).—In an attempt to clear up the mechanism of inoculation of plant tissues, the author investigated in vivo and by quick freezing under binocular microscope the mode of feeding by this aphid in sections of *Impatiens* stems several millimeters in thickness, the operation of the stylet and sheath being followed step by step and described in detail. From the results obtained it is believed that the protein coagulate of the salivary secretion is impermeable to such discrete particles as bacteria and even some viruses. These findings appear to render more understandable the inability of the green peach aphid to transmit such a highly contagious virus as that of tobacco mosaic.

A new genus—Tenuisanus—and species of Mexican leafhopper (Homoptera: Cicadellidae), D. M. DELONG. (Ohio State Univ.). (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 3, pp. 73–74, illus. 4*).

The 17-year cicada in 1945, W. J. SCHOENE. (Va. Expt. Sta.). (*Va. Fruit, 32 (1944), No. 9, p. 14*).—Note on brood two—due to appear in Virginia in 1945—and its control as an orchard pest.

Orius feeding records, G. F. KNOWLTON (*Bul. Brooklyn Ent. Soc., 39 (1944), No. 3, pp. 84–85*).—A note on bugs of the genus *Orius* as predators of other insects, particularly aphids and thrips.

A review of studies on the Mexican fruitfly and related Mexican species, A. C. BAKER, W. E. STONE, C. C. PLUMMER, and M. MCPHAIL (*U. S. Dept. Agr., Misc. Pub. 531 (1944), pp. 155, illus. 92*).—According to this contribution, the Mexican fruitfly is native to northeastern Mexico, where it infests fruit of yellow chapote (*Sargentia greggii*), and is widely distributed in Mexico, attacking mango, citrus, and other fruits. The incubation period ranged from 6 to 12 days under natural conditions in Cuernavaca and the larval period 18.5 to 35 days at a mean temperature of 70.5° F. Puparia are usually formed in the soil, and the length of time within the puparium ranges from 12 days at 87.8° to 107 at 53.4°. More than 95 percent of the adults emerge between 6 and 10 a. m., and emergence is much higher (69.3 percent) from moist soil than from dry (4.6 percent). Females begin oviposition after the first mating and continue laying irregularly during their subsequent life. Eggs are inserted in the skin of host fruit. Only essence of white wine and resinol spikenard were markedly attractive to adults when used in different types of traps. Nicotine sulfate (40 percent nicotine) as a spray used at the rate of 1 part to 200–300 parts of aqueous solution containing 5 percent molasses proved effective over a long period under low humidity conditions, but both toxicity and nicotine content fell off rapidly under conditions of high humidity.

Other fruitflies discussed include *Lucumaphila sagittata* Stone, *Anastrepha serpentina* Wied., *A. striata* Schin., *A. distincta* Greene, *A. fraterculus* Wied., *A. chiclayae* Greene, *A. aphelocentema* Stone, the bumelia fruitfly, Mexican West Indian fruitfly, and papaya fruitfly.

Numerous photographs, drawings, and curves supplement the text of this detailed study. A great deal of taxonomic information on the various species of fruitflies is also included.

Relations between Eurygaster integriceps and Phasiidae flies parasitic of the bug, and Phasiidae as a means for controlling it, D. M. FEDOTOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 3, pp. 134–136*).—Two phasiid flies, *Helomyia lateralis* Meig. and *Alophora (Phorantha) subcoleoptrata L.*, were found parasitizing this shield-backed bug in the Kashka-Darja District of the Uzebek S. S. R. Data presented on the life histories and biology of both host insect and parasites are believed to favor the possibility that these flies may be used in controlling the crop pest. Suggestions are offered as to procedures for collecting, studying, and applying the parasites.

The nature of the sex attractant of the female gypsy moth, H. L. HALLER, F. ACREE, JR., and S. F. POTTS. (U. S. D. A.). (*Jour. Amer. Chem. Soc., 66 (1944), No. 10, pp. 1659–1662*).—Benzene extractives prepared from the abdominal tips of virgin ♀♀ proved attractive to ♂♂ and there was a marked increase in attractiveness by hydrogenation. The attractant remained in the neutral fraction after saponification and reacted with phthalic anhydride; it was recovered from the phthalic acid ester by saponification. It appears to be specific for ♂ gypsy moths, and none of several synthetic materials tested exhibited any attractiveness.

Observations on the life history of Cucullia asteroides Gn., V. G. DETHIER (*Canad. Ent., 76 (1944), No. 8, pp. 161–162, illus. 5*).—Notes on the last instar and pupa of this hooded owlet moth which, in the fall, frequently destroys the flowers on numerous cultivated Compositae.

Japanese beetle control by parasitic insects, J. A. ADAMS. (N. Y. State Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, pp. 1, 9, illus. 4*).—A practical account.

Biological notes on Sinoxylon sudanicum Lesne and its parasites in S. India, P. N. KRISHNA AYYAR and V. MARGABANDHU (*Jour. Bombay Nat. Hist. Soc., 44 (1944), No. 3, pp. 460–465, illus. 2*).—On the economic importance, activities, life history, parasites, and host plants of this bostrychid beetle. It was particularly attracted to Cambodia cotton, boring into the stems of the green plant.

Uniparentalism in the Hymenoptera and its relation to polyploidy, S. E. Flanders. (Calif. Citrus Expt. Sta.). (*Science, 100 (1944), No. 2591, pp. 168–169*).—The author is led by his brief review of the literature to consider it not impossible that changes in the tetraploid and diploid composition of the ovarian tissues of the female result from changes in the environment. In fact, it has been observed for a number of species in which both sexes are uniparental that certain environal changes produce a marked change in the sex ratio, an example given being *Prospaltella perniciosi* parasitizing San Jose scale reared on peach twigs v. cow melon (*Citrullus*). Since it is unlikely that the change in host plants described would cause the chromosome number to change in all cells of the germarium, it is believed logical to assume that irrespective of the host plants the females in this species are uniparental and that the production of males when the peach is the host results from the occurrence of patches of diploid tissue in ovaries otherwise tetraploid.

Notes and news on sawfly larvae in Pennsylvania, H. C. Will (*Pa. Acad. Sci. Proc., 18 (1944), pp. 48–49*).

Hymenopterous parasites obtained from stored cases of Eurukuttarus confederata Grt. (Lepid.: Psychidae) collected in Chester County, Pennsylvania, J. L. Williams (*Pa. Acad. Sci. Proc., 18 (1944), pp. 50–51*).—A note on the hymenopterous parasites obtained from hundreds of cases of this bagworm moth, gathered in the late spring of 1942 from trunks of trees standing in open fields of unbroken sod or from poles along the highways.

Algunas notas sobre el hallazgo en Mexico de un microhimenoptero parasito de huevos de Triatoma pallidipennis (Stal) [Some notes on the incidence in Mexico of a microhymenopteran parasite of the eggs of T. pallidipennis], D. Peláez (*Ciencia [Mexico], 5 (1944), No. 1–3, pp. 29–33, illus. 3*).—On *Telenomus* (Scelionidae) parasitizing the eggs of assassin bugs (Reduviidae).

Additional ants recorded from Florida, with descriptions of two new subspecies, M. R. Smith. (U. S. D. A.). (*Fla. Ent., 27 (1944), No. 1, pp. 14–17*).—Records of 10 species, with notes, where possible, on their habits.

Bordeaux formulae and potato insect control, W. A. Rawlins, R. Staples, and J. J. Pratt, Jr. (Cornell Univ.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 486–492, illus. 3*).—Though bordeaux is the standard fungicide-insecticide used on potatoes in New York State, a low lime formula commonly recommended has not proved entirely satisfactory in areas where flea beetles and leafhoppers are important pests. From insectary tests it was found that hydrated lime is not as repellent to flea beetles as bordeaux, but that successive increments of lime from 2 to 8 lb. in 50 gal. water progressively increased the repellency of the mixture. The rise in effectiveness was most pronounced at a low level (2–50) of $CuSO_4$; at the highest concentration used (8–50) the low lime spray was only slightly inferior to the one containing a maximum of hydrated lime. Considering the various dilutions of $CuSO_4$, similar trends were noted when the amounts of Cu were varied within the limits of 2–8 lb. per 50 gal. of bordeaux. Data from field tests in the Buffalo area further indicated that the protection against flea beetles and leafhoppers afforded by bordeaux was better with a high than with a low lime formula. Tuber yields were also augmented with successive increments of lime, but the most pronounced increase occurred between the 2- and 4-lb. levels of lime. A concentration of $CuSO_4$ greater than 4 lb. did not appear necessary during the years under test. These results failed to confirm previous work in other sections of the State where a low lime proved superior to a high lime formula. The extent of Cu stimulation or bordeaux injury could not be determined from these experiments.

Tests of DDT for the control of potato insects, A. A. Granovsky. (Minn. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 493–499, illus. 1*).—During

1943, not less than 25 distinct dust and spray experimental combinations of various insecticides and fungicides were tested in several potato areas of Minnesota, including some of the newer materials, and in 1944 the tests included three of the seven commercial fields used in 1943. Only the results with DDT are reported upon in detail here, and these with especial reference to the potato leafhopper, potato flea beetle, and *Lygus oblineatus*. Though this work must be considered preliminary, it definitely indicates that DDT may become one of the most important insecticides for controlling both mandibulate and haustellate insects in potato fields. It is very promising for use against the Colorado potato beetle, as well as the tarnished plant bug and other mirids; though apparently less effective against leafhoppers, it gave results comparable with other insecticides used in their control. In addition to its insecticidal value, DDT also showed considerable value against late blight; furthermore, in these tests it has exhibited no phytocidal action.

Insects attacking soybeans stored in Illinois, M. D. FARRAR. (Ill. Nat. Hist. Survey). (*Soybean Digest, 4 (1944), No. 11, pp. 32, 65*).—A brief discussion of the insects involved and the conditions favoring their activities.

Life history studies of the sugarcane moth borer Diatraea saccharalis Linn., D. J. TAYLOR (*Fla. Ent., 27 (1944), No. 1, pp. 10–13*).—This study (Mar.–Dec. 1941) in the Everglades section of Florida—though insufficient on which to base definite conclusions as to the number of generations or molts in this area—has established many important facts which, it is believed, may be readily used as a beginning for further investigation of the ecological relations of the pest under the conditions obtaining in the State.

Crambus haytiellus (Zincken) as a pest of carpet grass, W. D. WYLIE (*Fla. Ent., 27 (1944), No. 1, pp. 5–9*).—The observations here reported—though limited in scope—indicate that this moth (Crambinae) may assume a role of considerable importance as a pest of carpet grass pastures in certain Florida areas. It appeared that the larval stage, at least, is relatively free of natural enemies.

Residual effects of insecticides on the cotton leafworm, E. E. IVY and K. P. EWING. (U. S. D. A. coop. Tex. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No., 4, pp. 513–515, illus. 1*).—In field plots in Texas, several treatments with lead arsenate or basic copper arsenate dust gave protection against the cotton leafworm for over 2 mo. following the last application and heavy rainfall; adjacent cotton dusted with calcium arsenate or cryolite was defoliated. In cage tests on field-growing cotton dusted twice and exposed to 6.93 in. rainfall after the second application, percentage reductions in numbers of leafworms 5 days after this treatment were with basic copper arsenate-sulfur (1–1) 82, lead arsenate 79, calcium arsenate 51, and cryolite 38.

Combate internacional à lagarta rosada [International control of the pink bollworm], W. L. WICKLINE (*Bol. Min. Agr. [Brazil], 32 (1943), No. 7, pp. 29–35, illus. 3*).

Garden foes: Identification, symptoms, and control of insect invaders, W. S. WORMSER (*New York: Wm. H. Wise & Co., 1944, pp. 63, illus. 88*).—This popular manual has been designed to contain the latest scientific facts, "coupled with the more practical methods of applying these facts to the small garden in wartime. Thorough study has been made of the available insecticides, and, where shortages are indicated, alternative treatments are so listed. Methods of treatment are accompanied with reasons for such treatment, or reasons for avoiding any particular treatment. This easy-to-read guide has been carefully constructed so that it painlessly instructs as well as directs."

Control of the pickleworm on squash and cucumber, O. F. BODENSTEIN. (Va. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 534–536*).—Cryolite, rotenone, and lead arsenate dusts and sprays of lead arsenate alone and with oil were applied to squash and cucumber. Of the materials tested on squash, cryolite gave significantly better control of the pickleworm; rotenone and lead arsenate dusts gave some control but the sprays proved valueless. The percentages of wormy fruits found on the various plots were for cryolite dust 1.63, rotenone dust 7.32, lead arsenate dust 6.62, lead arsenate spray 11.30, and lead arsenate and oil spray 12.21. The untreated plots had a 12.36 percent infestation. Weekly applications of cryolite dust kept the infestation below 3 percent through the August 20 picking except on August 13, when it reached 5.71 percent. Fruits picked from the check plots on July 28 were 6.67 percent wormy. The cryolite dust substantially increased the number of salable fruits, and it appears that with its use growers of summer squash could extend their harvest periods for substantially worm-free squash by several weeks. Cucumbers grown in a plot adjoining the squash were practically free of pickleworm injury, infestation being so light that the data were not tabulated.

Curculionídeos do tomateiro [Curculionids of the tomato], O. MONTE (*Biológico, 10 (1944), No. 4, pp. 103–108, illus. 5*).—On four snout beetles—two each of the genera *Phyrdenus* and *Faustinus.*

The problem of rosy apple aphid control, W. S. HOUGH. (Va. Expt. Sta.). (*Md. State Hort. Soc. Proc., 45 (1943), pp. 23–25*).

A study of the codling moth and its parasites in California, D. C. LLOYD (*Sci. Agr., 24 (1944), No. 10, pp. 456–473, illus. 1*).—Since reference to the literature (33 references) suggested that California might be expected to provide a richer fauna on the codling moth than any other section of North America and would probably also show an exceptionally high degree of control of such an introduced pest by native parasites and predators, a survey was made of this area in 1941; some of the data collected are here presented and discussed in detail. The results indicated that for native parasites and predators of the larvae and pupae the position in California is little better than that found by similar investigations in other sections of the continent. Though of sporadic distribution, the introduced *Ascogaster quadridentatus* Wesm. was probably the most effective larval parasite in the State. The native tachinid *Lixophaga orbitalis* Aldr. failed to build up appreciable populations in the course of the season, though present early in the year in most investigated areas; this species is believed to be already exerting its maximum effect on the host. The ectoparasitic species of *Aenoplex* on the spun-up larvae are not well adapted to exercise appreciable control; furthermore, the very low incidence of these ichneumonids in the summer broods of the codling moth suggests that other hosts may be utilized at this period. There were some data to show that under favorable conditions egg parasitism by *Trichogramma* spp. becomes high late in the season in a few areas in America, but these forms appear unable to give any satisfactory control. The possibilities of introducing California species into Canada receive brief consideration.

The codling moth problem, W. S. HOUGH. (Va. Expt. Sta.). (*Fla. Ent., 27 (1944), No. 2, pp. 40–42*).—A brief historical summary of codling moth control in commercial apple districts of Virginia, with suggestions as to the best current procedures.

Natural enemies of Comstock mealybug in the Eastern States, G. J. HAEUSSLER and D. W. CLANCY. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 503–509*).—Because of the increasing importance of this insect as an orchard pest, investigations have been carried on since 1939. Of the two primary parasites found spontaneously established in infested orchards, the solitary species *Clausenia purpurea* Ishii has been reared from nearly every orchard surveyed, but, though often extremely abundant, it is subjected to severe attack by secondary parasites. A gregarious species, *Allotropa convexifrons* Mues., has been reared from northern New Jersey and southwestern Connecticut. Of the five parasites imported from

Japan (1939–41) and widely colonized, two gregarious species, *A. burrelli* Mues. and *Pseudaphycus* sp., have become generally established in infested orchards, have demonstrated their ability to increase and spread rapidly, and have proved very effective in increasing the total parasitization in most of the areas where established; some reduction in mealybug damage to apple fruits was observed in orchards where their numbers had been reduced by high parasitization. Although several insects are known to be predaceous on this mealybug, they have not been observed to effect noticeable control; experimental releases of the ladybeetle *Cryptolaemus montrouzieri* Mils. indicated it to be ineffective in Virginia. An unidentified entomogenous fungus frequently kills large numbers in apple orchards of the State, but because of its dependence on favorable weather conditions it cannot be relied on for satisfactory control. Parasites were shown to be more consistent in reducing the host population and keeping it at a low level. This fungus has been recovered also from Ohio, West Virginia, and New Jersey.

Populations' of the European red mite as affected by spray schedules, C. R. Cutright. (Ohio Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 499–502, illus. 3*).—The records of the 5-yr. series of experiments reported upon—supported by numerous observations—led to the conclusion that, in general, the less sulfur used in the spray schedule for apples the less likelihood there will be of injury from the European red mite. As to the basis for this result, the main biological control agents at Wooster, Ohio, are predaceous mites of the genus *Seius;* these were found particularly susceptible to sulfur whereas the red mite, though somewhat inhibited, never undergoes a high mortality from this cause. Biological control of the red mite does not, however, eliminate spraying from the schedule, since a fungicide is usually needed in commercial orchards. Recent work with Fermate has indicated that it will become a valuable addition to the list of approved spray materials, but the tests here reported indicate that it holds little promise in schedules for red mite control; summer oil used against mites does not, however, lose its effectiveness when combined with Fermate. Since other fungicides are not suited to use on apples in Ohio, the sulfur schedules will probably continue to be employed. To obtain red mite control, then, such a schedule should be preceded by dormant oil, and in seasons when the populations develop rapidly this may have to be supplemented by a summer aracnicide applied when injury threatens; among such sprays, only two—summer oils and dinitros—are said to be now available. A test of Dow DN–111 at 20 oz. to 100 gal. gave very promising results.

Citrus pest problems in review, R. S. Woglum (*Calif. Citrog., 29 (1944), No. 12, pp. 340, 360–361, illus. 1*).—On insects and diseases.

Principales plagas del naranjo en la región de Sta. Engracia, Tamps. [Principal pests of the orange in the region of Santa Engracia, Tamps., Mexico], L. Tinoco C. (*Fitófilo, 3 (1944), No. 1, pp. 4–57, illus. 8*).

A new Cuban pest of citrus, Cryptocephalus marginicollis Suffr. (Col.), J. R. Watson (*Fla. Ent., 27 (1944), No. 1, pp. 13, 18*).—A note on damage to small orange fruits by this beetle in Cuba.

Progress report on the purple mite and its control, W. L. Thompson. (Fla. Expt. Sta.). (*Citrus Indus., 25 (1944), No. 10, pp. 5–9, 12, 14–15, illus. 1*).—This address concerns the progress (E. S. R., 88, p. 77) attained in investigations of *Paratetranychus citri* McG., infestations of which have been reported increasingly during the past 6 yr., with the winter of 1943–44 holding the record. Some growers believe that the spring nutritional sprays are responsible for the increased number of infestations of this mite, but the indications seem to be that the type of growth and climatic conditions have more influence on the occurrence of winter infestations than any spray applied in the spring. Details of life history, injury caused, and control work are summarized. Observations by competent field men and growers indicated that damage by this mite is of real consequence. Many materials were tested by the station in a preliminary way, but only a few of the more promising ones have been tried extensively. Among the latter, dinitro-*o*-cyclohexyl phenol (DN) alone or in combination has proved satisfactory for control under various conditions. In general, DN sprays were found most effective with wettable sulfur; next in effectiveness was a combination of neutral copper-wettable sulfur spray and least so a combination with zinc sulfate, hydrated lime, and wettable sulfur. Selocide has proved satisfactory when used 1–800 in combination with lime-sulfur and wettable sulfur. DN dusts were also tried. At present only suggestions can be made for a complete yearly program against this mite, but it appears that at least two treatments—excluding summer oil—will be necessary for control throughout the year.

Oil sprays with or without derris resins to control Florida red scale, M. R. OSBURN and W. MATHIS. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 516–519*).—Tests in Florida of petroleum oil emulsifiable with phthalic gyyceryl alkyd resin and with different amounts of colloidal bentonite clay were compared with the same oil sprays containing derris resins and with commercial oil stocks for controlling this insect on grapefruit and orange trees. Addition of derris resins to oil sprays increased the kill as determined by results taken 2 weeks after application. A stock emulsion prepared with 2.5 percent bentonite killed more scales than one made with 3.5 percent, but when the same amount of derris resins was added to each of these stock emulsions there was no significant difference in kill from sprays containing different quantities of the emulsifier. The experimental emulsifiable oil with derris resins gave better results than the same spray without derris, but it failed to quite reach the point of statistical significance. Commercial stocks at 1.66-percent oil concentration were, in general, no more effective than experimental stocks without derris resins applied at 1 or 1.25-percent strengths. Comparison of samples from each treatment 3 mo. after application failed to show any significant difference in infestations of living adult ♀ scales, indicating that the higher kills associated with some treatments immediately after application failed significantly to affect reinfestation.

Laboratory studies on effect of DDT on 3 major citrus scale insects, D. L. LINDGREN and J. P. LADUE. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 9, p. 16*).—Previous work with DDT against the California red scale (E. S. R. 91, p. 566) proved so significant that further tests were made to include that pest as well as the purple and black scales; the results are briefly summarized in this note.

Effect of DDT on three scale insects, D. L. LINDGREN and J. P. LADUE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 12, p. 350*).—See preceding abstract.

Control of the pecan nut casebearer with lead arsenate, nicotine sulfate, and summer oil, C. B. NICKELS and W. C. PIERCE. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 510–512*).—On the basis of experiments in southern Texas (1941–42), it is indicated that either two applications of lead arsenate and nicotine sulfate with summer oil emulsion or a first application of these materials followed by a second of lead arsenate are more effective than two treatments with lead arsenate in controlling severe infestations of the first generation of this pest.

Clinodiplosis hydrangeae sp. n. (Cecidomyidae) causing a leaf blister gall on Hydrangea hortensis, H. F. BARNES (*Entomologist, 77 (1944), No. 976, pp. 129–130*).—This new gall gnat is described from Cornwall, England.

Melipotis acantoides (Guen.) in Florida, J. R. WATSON (*Fla. Ent., 26 (1943), No. 4, p. 71*).—Defoliation of the royal poinciana *Delonix regia* by caterpillars of this noctuid moth is reported.

Sanitation in pest control, A. E. MICHELBACHER. (Univ. Calif.). (*Pests, 12 (1944), No. 9, pp. 5–6*).—An address on insect pests, with particular reference to buildings, food and other stored products, and the various household and dooryard conditions.

Protection of stored grain by means of dusts, M. J. OOSTHUIZEN (*Farming in So. Africa, 19 (1944), No. 219, pp. 371–379, illus. 5*).—Though treatment with some of the most promising dusts failed to give complete protection against weevils and bruchids, it very largely limited continued breeding; in this way the rate of depreciation of the grain and beans was considerably retarded. It would appear that the dusts used might be applied more successfully against cowpea bruchids than against corn weevils. Since some inert dusts such as kaolin, lime, and magnesium oxide are widely used as corrective agents medically, it is not considered necessary to remove them from the grain before use as food for man or animals; removal can, however, be effected by the ordinary cleaning processes prior to milling. Paris green, copper carbonate, and the fluosilicates and arsenates—being potent poisons—should be used only for preserving grain intended for seed. Since the efficiency of dusts is reduced in moist grain or humid atmospheres, their use under such conditions is to be questioned.

The biology of Tribolium destructor Uytt.—I, Some effects of fertilization and food factors on fecundity and fertility, J. M. REYNOLDS (*Ann. Appl. Biol., 31 (1944), No. 2, pp. 132–142, illus. 13*).—A brief review is presented on this species of flour beetle, and its potential danger as a pest is noted. It is shown experimentally that 85 percent extraction flour leads to about double the fecundity observed on the 60 or 75 percent product. The preoviposition period was affected by both larval and adult food. Unfertilized ♀♀ laid eggs, but these were infertile and relatively few. Oviposition was apparently stimulated when ♂♂ associated with unfertilized ♀♀, and also when they were removed from fertilized ♀♀; the presence of five ♂♂ seemed to lead to greater oviposition than when only one was present, but these conclusions are rather insecure because of small numbers. Although copulation occurred at frequent intervals, ♀♀ laid viable eggs for as long as 250 days after removal of the ♂. Fertility remained virtually constant throughout life when ♂♂ were present, and was not increased by the presence of more than one ♂. Fertility varied inversely with the number of eggs laid. The oviposition period was long and the average curve had a characteristic form, despite considerable daily and individual fluctuations. Oviposition may continue until death or may end some weeks before. Poor conditions tended to lengthen both oviposition period and length of life, the latter being greater for ♂♂ than for ♀♀.

The use of dichloroethyl ether as an acaracide, J. MUGGERIDGE and R. M. DOLBY (*New Zeal. Jour. Sci. and Technol., 25 (1944), No. 5, Sect. B, pp. 223–225*).—This material was found extremely toxic to the cheese mite *Tyroglyphus siro,* and to retain its toxicity over a relatively long period when applied to wood with which an infested cheese surface comes in contact. Exposure to the vapor had no effect on the flavor of the cheese.

Determination and evaluation of the resistance of textiles to insect pests, H. E. WILDE (*Rayon Textile Mo., 25 (1944), No. 9, p. 128*).—A note on methodology.

Studies on the biology of the webbing clothes moth (Tineola bisselliella Hum.), G. H. GRISWOLD (*[New York] Cornell Sta. Mem. 262 (1944), pp. 59, illus. 24*).—In this biological investigation of the webbing clothes moth it was determined that at a constant temperature of 75° F. the egg stage averaged 6.7 days, the larval period 30 for males and 35 for females (when larvae were fed a fish meal diet), the pupal stage 11.8, paired adult males 28.9, and paired adult females 13.2 days. The type of diet greatly influenced the length of larval instars and time required for the entire developmental period. On a fish meal diet the developmental periods were uniformly short. Females oviposited every month in the year and at 75° laid from 29 to 144 eggs. The preovipositional period varied from 1 to 8 days. The braconid *Apanteles carpatus* Say was the only parasite reared from the webbing clothes moth at Ithaca, N. Y.

Neogastrallus librinocens Fisher in Florida (Anobiidae: Col.), J. R. WATSON (*Fla. Ent., 26 (1943), No. 4, pp. 61–63*).—A note on the appearance of this tropical bookworm in the State.

The identification of termites in New Zealand, J. M. KELSEY (*New Zeal. Jour. Sci. and Technol., 25 (1944), No. 6, Sect. B, pp. 231–260, illus. 30*).—This paper includes keys and descriptions of species of termites recorded from New Zealand and eight introduced Australian species.

The flea genus Thrassis and sylvatic plague, with the description of T. brennani n. sp., G. F. AUGUSTSON (*Jour. Parasitol., 30 (1944), No. 4, pp. 237–240, illus. 3*).

The use of repellents against fleas, A. W. LINDQUIST, A. H. MADDEN, and C. N. WATTS. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 485–486*).—The test mostly used in this study was to expose a treated human arm in cages containing 500–1,000 fleas and to record the time between treatment and the first bite. The longest average time obtained was with a mixture of 1 percent pyrethrins and 2 percent IN–930 in mineral oil—a mixture now unavailable for practical use because of the scarcity of pyrethrum. Dimethyl phthalate, Rutgers 612, and Indalone proved very effective, giving an average repellent period of 139–260 min.—the first giving the longest; these materials are available for military use in the field. Clothing treated with these repellents gives protection from flea attack for several days.

Phlebotomus limai Fonseca in the United States (Diptera: Psychodidae), L. E. ROZEBOOM (*Jour. Parasitol., 30 (1944), No. 4, pp. 274–275*).—A listing of five species of this genus of mothlike blood-sucking flies, including notes on the one here reported and tentatively identified as *P. limai.*

Treatments listed to control cattle lice, cattle grubs, C. LYLE (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 10, p. 7*).—A practical account.

Control of lice on cattle, J. G. MATTHYSSE. ([N. Y.] Cornell Expt. Sta.). (*Farm Res. [New York State and Cornell Stas.], 10 (1944), No. 4, pp. 1, 8, illus. 2*). —A practical account.

[Symposium on medical entomology] (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 455–480*).—The following papers are included: Problems of Medical Entomology of Military Importance in Canada, by R. H. Ozburn (pp. 455–459); Relation of Insects to the Health of Military Personnel, by O. R. McCoy (pp. 459–464); Entomologists and the Sanitary Corps, by W. A. Hardenbergh (pp. 465–467); The Malaria Control Program of the U. S. Public Health Service, by S. B. Freeborn (pp. 467–469); Insect Control at Army Training Camps, by S. J. Carpenter (pp. 470–474); Entomological Services on the Program for Malaria Control in War Areas, by G. H. Bradley (pp. 475–477); and Recent Investigations of Insecticides and Repellents for the Armed Forces, by E. F. Knipling and W. E. Dove (pp. 477–480) (U. S. D. A.).

Population studies of Florida mosquitoes, V. G. DETHIER and F. H. WHITLEY (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 480–484*).—In the course of a mosquito survey, daily light-trap, biting, resting, and larval collections, as well as meteorological records, were made over a 20-mo. period. The nature and extent of this work permit of a more complete study of population densities and fluctuations than was heretofore possible in the Tampa section of Florida; this paper summarizes the results on frequency and distribution of the more common and economically important species.

The relation of the intersection line to the production of Anopheles quadrimaculatus, L. E. Rozeboom and A. D. Hess (*Jour. Natl. Malaria Soc., 3 (1944), No. 3, pp. 169–179, illus. 2*).—Studies to determine the relation of the intersection line (water-air, water-plant, and plant-air) to the production of the common malaria mosquito were made in eight species of littoral plants representing five ecological types—submerged, grass-lake, leafy-emergent, naked-emergent, and floating-leaved—during June-July 1943 in the northern Alabama section of the Tennessee River Valley, involving the collection of 805 one-fourth square meter samples from reservoirs and ponded areas. Results led to the conclusion that in individual plant species there is a close positive correlation between the production of this mosquito and the amount of intersection line per unit of water surface area, and that the increased production accompanying high intersection values is probably due to the combined effect of increased oviposition and decreased larval mortality; the only exception occurred in dense stands of the naked-emergent type *Eleocharis quadrangulata*, which appeared to present a mechanical barrier to oviposition. The findings also indicate that—with the above exception—the relative production of this mosquito in different species of plants is in direct proportion to their relative intersection values (unit of intersection line per unit of water surface), other factors being equal. The authors believe that this confirmation of the intersection line theory will give real aid in understanding and intelligently applying water-level management and other naturalistic measures used by the Tennessee Valley Authority for controlling malaria mosquitoes in impounded waters.

Airplane dusting for the control of Anopheles quadrimaculatus on impounded waters, C. W. Kruse, A. D. Hess, and R. L. Metcalf (*Jour. Natl. Malaria Soc., 3 (1944), No. 3, pp. 197–209, illus. 4*).—Major improvements in the method used by the Tennessee Valley Authority since 1938 have involved mainly the mechanics of the duster, methods of dust valve calibration, dust mixing and tagging, application and evaluation of the general field treatment practices, and specifications for paris green with special reference to particle size. Detailed descriptions and illustrations are presented of the equipment and its parts. Dusting is done during the calm of early morning at a usual flying height of 20–30 ft. The dust distribution curve was found noticeably skewed to the left, probably due to the torque of the propeller. About 20 percent of the paris green fell in the central 100 ft. of the dusting swath and another 8 percent in the second 100 ft.; the remainder drifted away from the treatment area and for practical purposes may be considered lost. A chart shows the effective swath widths of 70 percent and 90 percent larval kills under various conditions of plant cover, discharge rates, and distances between swaths. Studies on ingestibility, toxicity, and field distribution indicated the desirability of obtaining a paris green for airplane dusting of larger particle size than the ordinary commercially available material. A tentative revision is suggested for the particle size specifications for such use.

Two new species of Haemagogus from Colombia, H. andinus and H. boshelli (Diptera: Culicidae), E. Osorno Mesa (*Ent. Soc. Wash. Proc., 46 (1944), No. 7, pp. 165–176, illus. 23*).—The two new species of mosquitoes here described were found during a yellow fever survey in Colombia.

Organizacion de una colonia de Haemagogus equinus Theobald [Organization of a colony of H. equinus], E. Osorno Mesa (*Caldasia, No. 11 (1944), pp. 39–45, illus. 4*).—Studies on the organization and management of a colony of this culicid mosquito are noted, undertaken with the object of avoiding the influence of those climatic conditions which at certain times each year render specimens of the species unavailable for experimental transmission of yellow fever virus.

A measurement of the toxicity to mosquito larvae of the vapor of certain larvicides, M. A. Barber (*Pub. Health Rpts. [U. S.], 59 (1944), No. 39, pp. 1275–*

1278).—A very simple apparatus for studying the action of vapors on the larvae is described and the procedures and results with its use are discussed.

The possible role of Chara fragilis in mosquito control, R. L. CASTILLO (*Science, 100* (*1944*), *No. 2595, p. 266*).—The experiments here reported failed to indicate any pronounced controlling action of *C. fragilis* against the five most common mosquitoes of Ecuador (*Culex fatigans,* yellow-fever mosquito, *Aedes eupochamus, Anopheles albimanus,* and *A. pseudopunctipennis pseudopunctipennis*). Two of these are malaria vectors, while one may carry yellow fever and dengue.

Selection of anti-mosquito methods to fit specific malaria control programs, N. H. RECTOR (*Jour. Natl. Malaria Soc., 3* (*1944*), *No. 3, pp. 221–226*).—Preliminary to any efficient malaria control program it is necessary to determine the relative importance of the disease, location of the foci, habits of the vectors, and whether control is feasible and finally to select the control methods most applicable to the existing conditions. The author briefly discusses these questions and describes the appropriate methods to be used.

Orientation, H. J. WADEY (*Bee World, 25* (*1944*), *No. 8, pp. 59–61*).—A general discussion—including the author's observations—on the mechanism of orientation by bees.

Biodlingens betydelse i lanthushållningen (The importance of apiculture in agriculture and horticulture in Sweden), R. TORSSEL (*K. Lantbr. Akad. Tidskr., 83* (*1944*), *No. 2–3, pp. 218–239, illus. 12; Eng. abs., p. 236*).

The role of bees in the production of fruit and seed, J. I. HAMBLETON. (U. S. D. A.). (*Jour. Econ. Ent., 37* (*1944*), *No. 4, pp. 522–525*).—This is a general discussion of the role of insects in pollination and the factors—favorable and unfavorable—influencing it. Many opportunities for increasing production are now being lost through indifference to the conservation and propagation of wild pollinating insects and to the scientific and strategic use of honeybees. Competition among plant species for bee visitors will unquestionably explain many cases of luxuriant plant growth followed by seed failure. In the planting of crops thought should also be given to their ability to secrete nectar and to furnish pollen. Furthermore, the pollination of seed and fruit crops has been seriously hurt by the widespread and indiscriminate use of insecticides; only when man or livestock is endangered by these and other poisons have the hazards been emphasized. Better control—especially closer supervision—of the use of insecticides deserves consideration. Little thought has been given to the conservation of bumblebees, solitary bees, and other wild pollinating insects, which feed almost entirely on pollen and nectar. The planting of large areas in single crops has deprived the native bees of a succession of food plants and of suitable nesting places. The combined efforts of entomologists, agronomists, horticulturists, and farmers working in close cooperation could greatly improve seed and fruit production by safeguarding and utilizing the possibilities of insect pollination.

Variation in the sugar concentration of some southern nectars, E. OERTEL. (U. S. D. A. coop. La. State Univ.). (*Jour. Econ. Ent., 37* (*1944*), *No. 4, pp. 525–527*).—The percentage sugar concentration of nectar taken from the honey stomachs of honeybees caught in the blossoms of certain plants was refractometrically determined, and the number of samples, sugar concentrations, and range of readings are presented. English holly had the minimum average of 22.8 percent of sugar and the tung tree the maximum of 54.7 percent. A wide range in the sugar content of nectar from the same plant species was commonly found, indicating that nectar samples should be obtained at intervals during the blooming period if average readings are to be representative.

Cotton nectar in relation to bee activity and honey production, G. H. VANSELL. (U. S. D. A. coop. Univ. Calif.). (*Jour. Econ. Ent., 37* (*1944*), *No. 4, pp. 528–530*).

—Comparative studies of nectar secretion by the flowers of Pima, Acala, and SXP cotton in California showed that the first far surpasses the others in the quantity produced; very little extrafloral nectar was in evidence. Cotton floral nectar was low in sucrose; in orange nectar about 50 percent of the total sugar was sucrose. Bee activity in the collection of nectar from Acala cotton, which is grown exclusively in the San Joaquin Valley, was influenced adversely by the presence of other plants—particularly alfalfa—with richer nectars. Cotton produces an abundance of pollen, but the bees failed to collect it except by gleaning the clinging grains from nectar-gathering bees which entered the hive.

Some western nectars and their corresponding honeys, G. H. VANSELL. (U. S. D. A. coop. Univ. Calif.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 530–533*).—This paper presents data on the nectars of orange, cotton, eucalyptus, poinsettia, and waxplant, honey from vetch, and on honeydew from incense cedar; information from the literature (15 references) is compared. Nectars from different plants varied in odor, acidity, and content of sugars and ash, as well as in content of water and pollen. Cotton nectar was practically devoid of sucrose; that present in poinsettia nectar slowly changed to invert sugars without invertase being supplied by the bee. The ash values of both pollenless and pollen-carrying orange nectars were in line with those of orange honey, but in some samples of cotton honey the ash value was disproportionately high. The ash values of both honeydew and the resulting honey were higher than those of nectar or honey from floral sources.

Observations on bee repellents, F. R. SHAW and A. I. BOURNE. (Mass. State Col.). (*Jour. Econ. Ent., 37 (1944), No. 4, pp. 519–521*).—Under the experimental conditions in 1943, addition of creosote to spray mixtures (lead arsenate and flotation sulfur with and without wetting agents) invariably resulted in blossom injury, though in the test concerned the fruit crop was not sufficiently decreased to cause concern. The value of the materials used as repellents (creosote, Milkol, carbolic acid) is questioned, since the data indicated no great reduction in the amount of fruit from the treatment. Moreover, observations on bees actually working on the treated and untreated portions showed that within a day's time there were relatively as many of them in one case as in the other, provided there were any blossoms left that could be worked. Addition of lime appeared to reduce the foliage injury from creosote.

Notes on the longevity, sporulation, and diagnosis of Bacillus larvae, the cause of American foulbrood of bees, H. KATZNELSON and A. G. LOCHHEAD (*Sci. Agr., 24 (1944), No. 10, pp. 474–480*).—Incorporation of glucose in media for culturing *B. larvae* noticeably decreased its longevity. In dry soil it was found viable when tested after 228 days. Sporulation was almost completely suppressed in the presence of glucose. Media without added sugar were suited to spore formation, which was noticeably favored by sealing the culture tubes. Since a semisolid medium containing peptone, yeast, and carrot extract permitted more rapid germination from inocula of small numbers of spores (less than five) than a solid medium containing the same ingredients, the former is recommended for diagnosis of the organism in comb suspected of containing American foulbrood.

A sericicultura no Espírito Santo no quinqüênio 1938/43 [Sericulture in the State of Espírito Santo, Brazil, 1938–43], C. F. DE SOUZA (*Bol. Min. Agr. [Brazil], 32 (1943), No. 8, pp. 19–54, illus. 12*).

ANIMAL PRODUCTION

Defluorinated superphosphate for livestock, R. B. BECKER, G. K. DAVIS, W. G. KIRK, R. S. GLASSCOCK, P. T. D. ARNOLD, and J. E. PACE (*Florida Sta. Bul. 401 (1944), pp. 15*).—The composition and palatability of defluorinated superphosphate was studied, and the results of tests with beef cattle, dairy cattle, and swine in several pastures, by the authors separately, indicated that defluorinated superphosphate should substitute safely for steamed bonemeal for feeding livestock. On improved pastures beef cattle refused to take plain defluorinated superphosphate. In mixtures cattle preferred those with the larger proportions of salt. Dairy heifers on improved pastures chose a mixture of salt and defluorinated superphosphate 7:3 as compared with mixtures containing lesser proportions of salt. Dairy cows on improved pastures adjacent to brackish water preferred a 3:7 mixture of salt and defluorinated superphosphate. Pigs grazing peanuts ate slightly more of a swine mineral mixture containing bonemeal than another group consumed of the swine mineral mixture containing defluorinated superphosphate. The gains were also better.

The effect of storage on the retention of certain members of the vitamin B complex, C. C. LARDINOIS, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 875–880*).—Vitamin assays of 29 plant products, including hays and grains, when new and after storage in the dark at 20°–25° C. for 1 yr., unground and ground, showed that there were no essential losses in the thiamine, riboflavin, nicotinic acid, pantothenic acid, or biotin contents.

Grass and grass-alfalfa mixtures for beef production in eastern Washington, M. E. ENSMINGER, H. G. MCDONALD, A. G. LAW, E. J. WARWICK, E. J. KREIZINGER, and V. B. HAWK (*Washington Sta. Bul. 444 (1944), pp. 24, illus. 5*).—Calves weighing approximately 500 lb. were purchased after weaning in the three falls of 1941–43 and wintered on rations high in roughage. They were pastured at the rate of one steer per acre in 1941, and the rates of pasturing were adjusted to maximum beef production in 1942–43. The five pastures consisted of smooth bromegrass; crested wheatgrass; smooth bromegrass and alfalfa; crested wheatgrass and alfalfa; and smooth bromegrass, crested wheatgrass, and alfalfa. The pastures were 4 acres each. Summer grazing was started when the vegetation was about 6 in. high. Grazing at the rate of one steer per acre resulted in the pastures of single grasses being completely utilized in about 60 days in 1941, whereas the pastures of mixtures of grasses and alfalfa were considerably undergrazed. After the summer grazing, the steers were finished in dry lot on grain and hay to grade Choice to Good. Differences in the roughages or grains for wintering in different years in which various grains were utilized suggested that winter gains of 1–1.5 lb. per head per day seemed necessary to keep the cattle healthy and prevent loss of condition. In 1941 the grass pastures plus 221 lb. of grain produced an average of 158 lb. of beef per acre. The grass-alfalfa pastures plus an average of 611 lb. of grain produced an average of 331 lb. of beef per acre. In addition to the beef produced, the grass-alfalfa pasture provided a grazing season that was about twice as long as that provided by the single grasses.

Value of sorghum silage for beef production (*Arkansas Sta. Bul. 443 (1944), pp. 11–12*).—In a 105-day feeding test with 10 Hereford calves in each of 4 lots on 0.75 lb. per 100 lb. live weight of a grain mixture of ground yellow corn, cottonseed meal, and minerals, the average daily gains of those receiving different sorghum silages were Atlas sorgo 1.45 lb., Blackhull kafir and hegari 1.54 each, and Honey sorgo 1.3 lb. Atlas sorgo also produced a higher yield of silage per acre. The higher fiber content of the Honey sorgo silage probably accounted for its lower feeding value.

Wheat for fattening calves, G. A. BRANAMAN (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 8–15*).—Ground wheat as the only grain in rations with red clover-alfalfa hay, with or without corn, soybean meal, and silage compared very favorably with ground or shelled corn in rations for fattening calves in two experiments. After feeding 112 days in the first experiment with 390-lb. calves, the grains were reversed for 43 days. In a second experiment four lots of ten 425-lb.

calves each served for the comparison for 184 days. Refusal to eat liberal quantities of the wheat ration seemed to be the chief limitation. It was necessary to keep wheat before the calves most of the time to secure adequate consumption. Mixing with other grains or silage may result in increased consumption and gains. The fat of wheat-fed cattle was whiter than that of cattle fed yellow corn.

Vitamin A and carotene content of the blood plasma of beef and dairy calves from birth to four months of age, H. F. NELSON, L. A. MOORE, R. E. HORWOOD, and G. A. BRANAMAN (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 50–53*).—Blood samples of Ayrshire, Brown Swiss, Guernsey, Holstein, Jersey, Angus, Hereford, and Shorthorn calves were analyzed at 2-week intervals by methods of Pett and LePage (E. S. R., 84, p. 702) for vitamin A and carotene produced under winter feeding conditions. The plasma of the beef calves showed appreciably higher vitamin A contents than dairy calves, probably due to the access of the beef calves to the milk of their dams when dairy calves received limited amounts of Holstein milk. If difficulty is experienced in raising young calves, feeding 1–2 teaspoons of fish-liver oil is recommended up to 3 mo. of age.

Influence of age, type, and fertility in Rambouillet ewes on fineness of fiber, fleece weight, staple length, and body weight, J. M. JONES, W. H. DAMERON, S. P. DAVIS, B. L. WARWICK, and R. E. PATTERSON (*Texas Sta. Bul. 657 (1944), pp. 30, illus. 3*).—In a study of the factors affecting the amount and character of about 3,000 fleeces from B and C types of Rambouillet ewes and rams at the Sonora Substation over an 18-yr. period, the heaviest scoured fleeces occurred during the third age year, but differences in the production of fleeces during the third and fourth age years were not significant. Staple length was greatest during the first age year, but there were no significant differences in staple length between the second, third, and fourth age years. By the sixth age year the staple length had decreased approximately 0.3 in. and by the eighth age year 0.44 in. The wool of ewes producing lambs averaged 0.08 in. shorter and produced fleeces that averaged 0.57 lb. per head lighter and 0.27 lb. less in scoured wool than ewes not producing lambs during the year. In fineness of fiber the diameter of the wool during the first age year was slightly but significantly less than in succeeding years, but changes subsequently were so slight as to be of no practical importance. Fleeces from C-type ewes had a higher commercial value than those from B-type ewes, because the C-type or relatively smooth-bodied ewes had greater length of staple and produced finer and more uniform fibers than the B-type ewes. No significant differences were observed in scoured fleece weights of B- and C-type ewes, but on the unscoured fleece basis the B-type ewes produced about 1 lb. more than ewes of the C type per head. In shrinkage, fleeces of the B-type ewes averaged 62.9 percent and those from the C-type ewes 59.4 percent. The body weights of the plain-bodied and wrinkled types did not show significant differences. Wool samples measured were taken from the shoulder, side, and thigh regions of the body.

Greater production through more efficient livestock management (*Arkansas Sta. Bul. 443 (1944), pp. 9–10*).—In this experiment, an average daily gain of 1.3 lb. was made by pigs self-fed ground wheat with 0.25 lb. per head per day of a protein mixture consisting of 40 parts tankage, 30 parts soybean meal, and 30 parts cottonseed meal, as contrasted with an average daily gain of 1.6 lb. made by another group of pigs on the same feeds with 0.5 lb. of the protein mixture. A third lot self-fed the protein mixture consumed 0.7 lb. per day and made an average daily gain of 1.7 lb. All of the 3 lots of 27 pigs each were fed on Sudan pasture.

Value of soybean meal prepared from damaged (bin-burned) soybeans as a feed for growing swine, J. L. KRIDER, B. W. FAIRBANKS, and W. E. CARROLL. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 9, pp. 383–387*).—No statistical difference was found in the feeding value of normal expeller-process soybean meal or soybean meal made from bin-burned soybeans when fed as supplements to ground yellow corn and minerals in dry lot. The study was conducted with 10 pairs of 28- to 80-lb. pigs over a 134-day period, limited to equal gains. More economical gains as measured by feed per pound of gain were made by the normal meal in 5 pairs, whereas meal from bin-burned soybeans proved more economical in 4 pairs and there was no difference in 1 pair. The amounts of feed consumed per pound of gain by the different pigs varied from 3.15 to 4.88 lb. on the normal meal mixture, with gains on the other meal coming within this range. The soybean meals made up, respectively, for the normal and bin-burned soybeans, 33 and 30 percent of the ration to 75 lb. live weight, 25 and 22 percent from 75 to 125 lb. live weight, and 20 and 18 percent for live weight above 125 lb.

Tryptophane derivatives in the urine of pyridoxine-deficient swine, G. E. Cartwright, M. M. Wintrobe, P. Jones, M. Lauritsen, and S. Humphreys. (U. S. D. A. et al.). (*Bul. Johns Hopkins Hosp., 75 (1944), No. 1, pp. 35–47, illus. 2*).—Study has been made of the presence of kynurenine, kynurenic acid, and xanthurenic acid—three excretory products of tryptophan metabolism—in the urine of pigs on a pyridoxine-deficient ration. Excretion of these substances ceased on administration of adequate amounts of pyridoxine. "The results of measurements of kynurenic acid in the urine of normal as well as pyridoxine-deficient animals gave equivocal results. The data obtained suggest that in the pyridoxine-deficient pig a fault in the metabolism of tryptophan is reflected by increased excretion of xanthurenic acid rather than kynurenic acid. In the urine of pyridoxine-deficient animals a red pigment was observed to develop on the addition of strong mineral acid. Data are presented which suggest that this is urorosein. The excretion of this pigment, like that of 'kynurenine' and of xanthurenic acid appeared to be related to the intake of tryptophan and disappeared on the administration of pyridoxine." The presence of urorosein in the urine of humans with pellagra may be due to pyridoxine deficiency, but the pigment is found in human urine under conditions unrelated to pyridoxine deficiency.

Estimating the weight of draft horses, L. H. Blakeslee (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 63–66, illus. 2*).—A table is presented from which the live weights of draft horses could be predicted from measurements of heart girth based on measurements and observations of 43 Belgian and Percheron foals at monthly intervals from birth. The weight was predicted from the equation $y - c = ae^{bx}$, wherein $y =$ the weight, x is the heart girth in centimeters, and c, a, e, and b are constants calculated as —572.15, 286.46, 2.178, and 0.00996, respectively. A standard deviation of only ± 12.32 lb. was calculated from the observed measurements.

What dog is that? W. E. Blythe and J. N. Kane (*New York: Greenberg, 1944, pp. 60+, illus. 120*).—Brief descriptions and illustrations of 120 breeds of dogs.

Unidentified factor(s) in yeast and liver essential to cure of achromotrichia in dogs on synthetic diets, D. V. Frost and F. P. Dann (*Jour. Nutr., 27 (1944), No. 5, pp. 355–362, illus. 2*).—Equal responses were obtained in dogs from the administration, orally or by injection, of six synthetic components of the vitamin B complex. Growing dogs receiving thiamine, riboflavin, nicotinamide, pantothenate, pyrodoxine, and choline developed achromotrichia and decreased hair growth in 2–11 mo. Inositol, *p*-aminobenzoic acid, and biotin were ineffective in changing the course of the deficiency, whereas liver fractions or whole dried yeast brought about complete cures. Responses to oral and injection administration of the vitamins of the B complex gave equal results and improved the general body tone and blood picture. There were employed in the study six puppies and one 2-month-old dog.

Studies of pantothenic acid deficiency in dogs, R. H. SILBER (*Jour. Nutr., 27 (1944), No. 5, pp. 425–433, illus. 3*).—In studies with 22 dogs, "the first manifestations of pantothenic acid deficiency in pups were an erratic, decreasing appetite and a decrease in urinary excretion of the vitamin. Growth and food intake showed parallel decreases prior to collapse after 2 mo. The deficiency responded to oral therapy. Older dogs showed a delayed effect on appetite; the urinary pantothenic acid content was decreased but was still essentially normal after 3 months' depletion. This is in agreement with the fact that the pantothenic acid requirement of older dogs is lower. The concentration of pantothenic acid in blood and other tissues of pantothenic acid-depleted dogs was below that of controls dosed with large amounts of calcium pantothenate; however, when compared with stock diet dogs, the only significantly low pantothenic acid levels were found in liver, muscle, brain, and blood. Repeated oral dosage with calcium pantothenate increased tissue levels above those found in dogs on stock diet and appeared to have a delaying effect on the progress of subsequent depletion. The only gross pathological changes observed as a result of the deficiency were fatty livers. These were observed primarily in the depleted pups but also, to a lesser degree, in the control dogs on the same diet supplemented with calcium pantothenate. This was not true of control dogs which received a dried-beef-liver supplement in addition. Spasticity was observed in the hindquarters during the last week of the deficiency."

The influence of breeding on the livability of poultry, C. H. BOSTIAN and R. S. DEARSTYNE (*North Carolina Sta. Tech. Bul. 79 (1944), pp. 24, illus. 6*).—Chicks hatched from selected matings of 1941 had less than one-third the mortality to 3 mo. of age of chicks from unselected matings of 1937–38, when the experiment was started with 3 pens of about 15 Single-Comb White Leghorn females showing some inbreeding and 3 pens of a like number of hens of superior production lines mated with 3 males of production strains but unrelated. The experiment was continued in 1939 with 4 pens selected from individuals from lines that had demonstrated superior livability and satisfactory production and 2 pens in which the parents had been selected from hens whose progeny ranged from average to below average in livability but also had good production records. The work was continued in 1940 with 8 pen matings, 5 from superior and 3 from average to poor livability which served as controls. In 1941, 8 pens were again utilized, with 2 serving as controls. The average number of pullets hatched from the same parents and retained was 8.7 in 1940 and 11.6 in 1941. The weights of the birds at periodic intervals and egg production and egg weights were recorded. Family performances for livability and egg production were emphasized in making the selections. Mortality was reduced by selection based on sib-testing and progeny performance, but there was little effect when selection was made for specific diseases. Pullets weighing less than average had a slightly higher mortality than that observed for all pullets. There was no difference in the livability of the progeny of pullets and hens.

A recommended cross for broiler production (*Arkansas Sta. Bul. 443 (1944), pp. 10–11*).—In experiments on growth of broilers, it was found in 12 different breed crosses that early growth was not consistently increased by crossing and that greater early growth of crossbreds depended primarily on the inbreeding of the purebred parents used in making the cross. At 12 weeks of age, purebred Barred Plymouth Rocks averaged 2.3 lb., whereas hybrids between Barred Plymouth Rock males and New Hampshire females averaged 3 lb. The hybrids required only 4 lb. of feed per pound of gain as contrasted with 4.4 lb. for the purebreds.

Feeding methods reflect profits in broilers (*Arkansas Sta. Bul. 443 (1944), p. 11*).—In two series of studies of feeding methods for broilers to 12 weeks of age, each series was divided into 3 lots of 100 chicks each. The lot on a 19.5 percent protein starter mash averaged in live weight 2.27 lb. The second lot, on the starter mash to 6 weeks of age with a grower mash of 16.5 percent protein thereafter, averaged 2.15 lb. at 12 weeks of age. The third lot, which received the starter mash throughout the 12 weeks but had access to a scratch ration of whole wheat and medium corn chops during the last 6 weeks, averaged 2.31 lb. The cost may be reduced by liberal feeding of grain after 6 weeks.

Metabolic changes in growing chickens, H. H. Kibler and S. Brody. (Mo. Expt. Sta.). (*Jour. Nutr., 28 (1944), No. 1, pp. 27–34, illus. 2*).—Supplementing studies of the metabolism and growth rate of rats (E. S. R., 89, p. 399), a systematic study is reported of changes in the metabolic level of four male and four female Rhode Island Red chickens during growth. The oxygen consumption in relation to body weight, age, and surface area was recorded at regular intervals from hatching to 6 mo. of age for males and 13 mo. of age for females. There was an apparent parallelism during the first 2 mo. after hatching between metabolism per day expressed in Calories per square meter, and growth per day expressed in grams per square meter. The resting but nonfasting heat production increased from about 750 Calories at hatching to a maximum of 1,250–1,300 Calories at about 30 days and decreased thereafter to 900 Calories at 60 days. The maximum growth rate of about 370 gm. per square meter was attained at about 25 days with a decrease thereafter. The nonfasting heat production of females after 2 mo. of age averaged about 900 Calories. This was lowered to about 750 Calories in females after fasting. Higher values were obtained for males.

Soybean oil meal in chick rations, G. F. Heuser and L. C. Norris (*[New York] Cornell Sta. Bul. 810 (1944), pp. 22, illus. 2*).—In a series of experiments, groups of usually 30 Rhode Island Red or Single-Comb White Leghorn chicks were fed rations containing about 20 percent protein, mainly from soybean meal. Significantly lower weights were produced at 8 weeks of age than in lots which received some animal protein. Fish meal, meat scrap, and dry skim milk showed a supplemental effect with soybean meal which was not shown by extra alfalfa meal or cereal grass. Extra soybean meal decreased growth rate and increased feed consumption per unit of gain. There was required 1–2 percent of fish meal or 2–3 percent of meat scrap or dry skim milk for the most satisfactory growth to 8 weeks of age with the soybean meal protein. Feed efficiency was closely related to rate of gain and both were improved with the addition of some animal protein. When satisfactory weights were produced at 8 weeks of age, approximately 3 units of feed were required to produce 1 unit of gain. The feed required per unit of gain was increased 10–30 percent on the all-vegetable protein rations (soybean meal). When 3 percent fish meal protein was added, the remainder of the protein could be furnished by (1) 25.5 percent soybean meal, (2) 20.5 percent soybean meal and 10 percent corn gluten feed, or (3) 17.5 percent soybean meal and 10 percent linseed meal. The combination of 12.5 percent soybean meal, 10 percent corn gluten feed, and 10 percent linseed meal was not quite so effective.

When sufficient animal protein was available during the first 8 weeks for maximum growth, the birds continued to grow normally to 24 weeks without animal protein in the ration. When no animal protein was available during the first 2 mo. the average weights were lower, but growth was accelerated when animal protein or grass silage was added to the soybean meal portion of the ration. This resulted in no difference in the weight at 24 weeks of age from these groups. The all-vegetable protein rations delayed sexual maturity and egg production for several weeks. Pullets given no animal protein up to 36 weeks of age did not attain the same average weight, even at 44 weeks of age, as pullets that received some animal protein in their ration. There were added as proteins to the rations of different groups up to 8 weeks of age different percentages of fish meal, meat scrap, and dry skim milk, and combinations of them in different lots. Lesser numbers of pullets and cockerels were continued to 24, 36, and 44 weeks of age.

Ground raw soybeans not equal to soybean meal for poultry, G. F. Heuser. ([N. Y.] Cornell Expt. Sta.). (*Farm Res.* [*New York State and Cornell Stas.*], *10* (*1944*), *No. 4, pp. 4, 5*).—In tests of 17 and 34 weeks' duration, egg production with soybean meal and several sources of animal protein was practically equivalent, although ground raw soybeans were definitely inferior as a source of protein for egg production. In two experiments with chicks during the seventh week of age, 92 and 88 percent, respectively, of the growth produced by casein were produced by soybean meal, and only 57 and 60 percent of the casein growth were produced by ground raw soybeans as a source of protein.

The iron content of whites and yolks of eggs from hens fed various iron supplements, P. J. Schaible, J. A. Davidson, and S. L. Bandemer. (Mich. Expt. Sta.). (*Poultry Sci., 23* (*1944*), *No. 5, pp. 441–445*).—Eggs from hens receiving a basal ration and later the same ration supplemented with high levels of ferrous sulfate, ferrous sulfate in sulfuric acid solution, ferric oxide, and proprietary iron preparation were separated into whites and yolks and analyzed individually for iron by the *o*-phenanthroline method referred to on page 322. A variance analysis showed that individual hens had characteristic levels of iron in the yolk, but there were no significant differences in the iron content of the whites and yolks associated with the high and low levels of iron in the ration. Hens of the White Leghorn, Brown Leghorn, and Barred Rock breeds showed no differences between breeds. During cold storage the iron of the yolk progressively passed to the white.

Tracheal injection method for short-time preservation of dressed poultry, A. A. Uspensky, trans. by H. P. Thielman and edited by G. F. Stewart (*U. S. Egg and Poultry Mag., 50* (*1944*), *Nos. 8, pp. 342–345, 373–374; 9, pp. 412–414; 10, pp. 464–466*).—There is given a review of the results on the salt content and spoilage of poultry injected by the tracheal method with different strengths of salt solutions and storage temperatures.

Comparison of response of turkey poults and of chicks to different forms of vitamin D, H. R. Bird. (Md. Expt. Sta.). (*Jour. Nutr., 27* (*1944*), *No. 5, pp. 377–383*).—Bone ash, supplying about 80, 120, 160, and 200 A. O. A. C. units of vitamin D from two sources of cod-liver oil per 100 gm. to a vitamin D-deficient ration, and half this amount from irradiated 7-dehydrocholesterol gave results showing that Vitamin D was 2.29 times as effective from the irradiated sterol and 1.83 from the irradiated animal provitamin for turkeys as for chickens. The studies were based on the live weights, gains per gram of feed consumed, and bone ash at 4 weeks of age for 318 turkey poults fed in 2 groups with a total of 22 lots. The results with chickens and turkeys were similar for cod-liver oil, but the turkeys utilized the D in irradiated products more efficiently, confirming the findings of Boucher in the following paper.

Efficacy of vitamin D from different sources for turkeys, R. V. Boucher. (Pa. Expt. Sta.). (*Jour. Nutr., 27* (*1944*), *No. 5, pp. 403–413, illus. 2*).—The vitamin D of an irradiated animal sterol and irradiated 7-dehydrocholesterol was more efficaciously utilized by turkeys on the basis of chick units fed than the D of cod-liver oil. The order of difference was about 2 to 1, although fortified sardine oil was more efficacious than reference cod-liver oil, its response curve being more nearly like that of cod-liver oil than that of the irradiated products. The sources of vitamin D were tested as supplements to a rickets-producing ration when fed over a 4-week period to about 20 lots of 12- to 14-day-old poults in each of two experiments. In each experiment at least four amounts of the vitamin D sources were fed and the effect on body weight as well as bone ash ascertained.

Large versus small type turkeys, M. I. Darrow and C. L. Morgan (*South Carolina Sta. Bul. 350* (*1944*), *pp. 12, illus. 5*).—Comparisons were made at 2-week intervals over 2 yr. on the rate of gain, feed consumption, and marketing condition of Small White and Broad-Breasted Bronze turkeys to 26 weeks of age. The average weight at this age in Small White males and females was 12.54 lb., and for Broad-Breasted Bronze of both sexes 17.96 lb. The feed required per pound of gain by birds of these breeds grown on range was 4.39 and 4 lb., respectively. For turkeys grown in confinement there were required 4.53 and 4.37 lb. of feed, respectively, per pound of gain. In each year the lots contained 100 birds of each variety.

The National Turkey Improvement Plan (*U. S. Dept. Agr., Misc. Pub. 555 (1944), pp. 25+, illus. 8*).—As in case of the National Poultry Improvement Plan and supplement (E. S. R., 88, p. 669), this program was designed to improve the production and market quality of turkeys and reduce losses from disease, and through it, it is suggested, turkey breeding stock and hatching eggs should be more efficiently identified and produced.

Gifts of the Americas: The turkey, S. PODOLSKY (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 11, p. 219*).—An account of the finding in Mexico of the first turkey.

DAIRY FARMING—DAIRYING

A standard for evaluation of dairy sires proved in dairy herd improvement associations, N. N. ALLEN. (Minn. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 835–847, illus. 5*).—The performance of the daughters of the Holstein, Guernsey, Jersey, Ayrshire, and Brown Swiss sires proved by the dairy herd improvement associations prior to 1940 (E. S. R., 84, p. 97) was calculated in connection with the dams' production of milk fat and fat percentages. The sire's performance is calculated from twice the deviation of the sire's daughters' production from that expected based on the average of the two parents. In calculating the probable production of future daughters only the deviation from expectancy is needed, the expected production being estimated from the dams to which the bull is mated. Brief comment is presented on some of V. A. Rice's suggestions[1] on sire indexing of Ayrshire bulls, which involve some of the same principles of regression.

The nutritive value of alfalfa hay.—II, Starch and glucose as supplements to an all alfalfa hay ration, C. F. HUFFMAN and C. W. DUNCAN. (Mich. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 821–833*).—Continuing this series (E. S. R., 88, p. 93), cows on an alfalfa hay ration from calving showed a sharp drop in milk production after about 6–10 weeks, when the necessary factor or factors for milk production were exhausted. When as much as 6 lb. of cornstarch or corn sugar were added to the ration, the amount of alfalfa hay was not reduced unless the appetite was affected. The supplement was placed on the hay and the cows consumed it with relish without modifying the milk production significantly, in about 25 feeding trials of approximately 12 days' duration. The replacement of 6 lb. of cornstarch or glucose with 6 lb. of corn or wheat increased the production rate of fat-corrected milk, thus suggesting that both corn and wheat furnish the deficient factor or factors. Calories were not the limiting factor in milk production, since corn and wheat supplied the unknown stimulating conditions.

The value of kelp meal in rations for dairy cattle, M. H. BERRY and K. L. TURK. (Md. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 861–866*).—Additions during gestation of 4 percent kelp meal to normal rations of 39 heifers of the Holstein, Guernsey, Jersey, and Ayrshire breeds showed no particular benefit for growth, breeding efficiency, general health, physical condition, appetite, and size and condition of calves at birth as contrasted with a like number of heifers receiving no kelp meal. The supplement of kelp meal was continued for 25 of the heifers through the second gestation period without particularly favorable effect being noted on breeding efficiency, feed consumption, or milk production. The control group produced an average of 8,086.9 lb. of fat-corrected milk as contrasted with 7,698.2 lb. by the group with the kelp supplement.

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[1] Ayrshire Digest, 29 (1943), No. 12, pp. 14–16, 79–84, illus. 6; 30 (1944), No. 2, pp. 8–9, 36–37, illus. 1.

Dried citrus peel and pulp as a feed for lactating cows, O. C. Copeland and C. N. Shepardson (*Texas Sta. Bul. 658 (1944), pp. 17*).—In five separate experiments of 90 days' duration each, citrus peel and pulp were compared with corn and cob meal for milking cows by the double-reversal method. Two groups were fed in each experiment on rations including 50 percent of each feed with reversal at the end of 30 days. The first 10 days of each period was considered as preliminary. The final results were indicated as the differences between the average milk production, feed consumed, and changes in live weight in the average of the first and third periods compared with the second period. The differences in milk production and live weight increases were small, but in all but one of the five experiments milk production slightly favored those fed the ground corn ration. The productive energy of citrus peel and pulp was calculated as 74.4 therms per 100 lb. as compared with 74.7 therms for corn and cob meal. The citrus peel seemed to have some beneficial effect on appetite in extremely hot weather. No effect was detected on the flavor of the milk. The experiments were conducted with 7, 6, and 6 pairs of Jersey cows, respectively, fed in dry lot in the station herd and 10 and 9 pairs of Holstein and Jersey cows fed in dry lot with access to pasture and hay in the college herd.

Feeds of quality supply vitamin A for dairy animals, W. C. Cowsert (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), No. 10, p. 8*).—The carotene contents of various hays and silages before and after storage for different intervals are tabulated.

Effect of colostrum on the vitamin A and carotene content of blood plasma of new-born calves, L. A. Moore and M. H. Berry. (Md. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10. pp. 867–873*).—The vitamin A and carotene content of blood drawn from Holstein, Ayrshire, Jersey, and Guernsey calves, born in the university herd, and at each day for 1 week as ascertained by methods of Moore (E. S. R., 81, p. 832) and modified by Kimble (E. S. R., 83, p. 708) showed that the vitamin A content of the blood plasma at birth was low, but with the intake of colostrum there was a fivefold increase at the end of 24 hr. There was a gradual increase in vitamin A and carotene until a maximum was reached in about 3 days, followed by a gradual decline. The breeds showed no marked differences in the vitamin A content of the blood plasma at comparable ages, but the carotene content of the Guernsey and Jersey plasma was three or four times higher than that of Holstein calves. In three calves that received no colostrum, but whole milk instead, the plasma and carotene showed little increase and two of the calves died of infection. Calves probably build up the plasma vitamin A and carotene when colostrum is received, but maximum values were not attained when the calves did not have access to carotene through suckling their dams after 12–24 hr., and their health may suffer. The plasma carotene and vitamin A determinations were made on blood samples of about 15 calves of the Holstein, Ayrshire, and Guernsey breeds at each age, with lesser numbers of Jersey calves and smaller groups in the specially treated lots.

The ratio of ascorbic, nicotinic, and pantothenic acids, riboflavin, and thiamin in late summer milk, A. D. Holmes, C. P. Jones, A. W. Wertz, K. Esselen, and B. V. McKey. (Mass Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 849–855*).—The amounts and ratios of these vitamins in the herd milk of dairy cows of several breeds were ascertained. The pasture grasses were fully matured, but before severe frost had affected their quality. The pasture ration was supplemented with ground grains containing 14 percent protein. The ascorbic acid, nicotinic acid, pantothenic acid, riboflavin, and thiamine were mainly ascertained in

15 herd samples of combined night and morning milk as 18.4, 1.1, 3.66, 1.37, and 0.44 mg. per liter of milk, respectively. To meet recommendations for infant feeding, the milk would have to be fortified with ascorbic acid and nicotinic acid.

New techniques in milking, G. H. Hopson (*Agr. Engin., 25 (1944), No. 8, pp. 295–296, illus. 5*).—General discussion of the physiology of milk secretion with application to the mechanical milker.

Supplementary home sanitation of milk shipping cans, M. C. Jamieson and M. K. Chan (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 8, pp. 55–56, 58*).—Spraying 364 cans with one of several germicide cleaners before use for milk reduced the bacteria in the cans to practical insignificance.

Accounting for milk fat, E. O. Herreid, D. W. Whitman, and R. O. Slack (*Vermont Sta. Bul. 512 (1944), pp. 20*).—This study of the difference in the amounts of milk fat received by the milk station and accounted for at the milk plant by the Mojonnier and Babcock tests showed that creameries using the Babcock test on semimonthly composite samples should be able in milk, cream, and skim milk to account for fully 99 percent of the milk fat received. There were indications that more total milk fat was received than when the Majonnier method was used in daily testing, but the excess should not be more than 1 percent. Majonnier test results agreed with Babcock test results on unpreserved milk, but were lower than those for cream and significantly higher than those for skim milk. The fat determined in milk, cream, skim milk, and rinse water by the Babcock test totaled slightly less than that recovered by the Majonnier test. There was a tendency to overread Babcock test samples of milk and cream because of the upper meniscus of the fat column. It is also noted that the Surplus Marketing Administration order No. 4 overrates the capacity of 10-gal. cans for 40 percent cream. The fat contents of composite samples were ascertained for 15 to 16 days at five different times during the year.

Influence of Balbo-rye pasture on the odor of milk, G. M. Trout and R. E. Horwood (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 39–47, illus. 1*).—Studies of the feed odor in the milk from groups of about 20 cows each on three kinds of pasture showed that the average feed odor from June grass was negligible, that from Balbo rye was slight to distinct, whereas that from common rye was distinct to very pronounced. The odor of milk from the Balbo rye was not offensive but was grassy, whereas milk from cows on common rye pasture was decidedly offensive, suggesting soap or fishy odor. Samples of the milk were obtained 1 to 2½ hr. after the cows were removed from the pasture. The Balbo and common rye were over 3 ft. in height. Milk from 47 cows on Balbo rye pasture was pasteurized and distributed by the college creamery without any flavor complaints being received. The offensive flavor generally produced by common rye was not observed in the milk produced on Balbo rye. No off-flavors were noted in the milk except in cows milked immediately on removal from Balbo rye pasture. Slight to distinct feed odors were noted in some samples of mixed milk, but no flavor complaints were received.

Control of mold growth in composite milk samples, J. M. Frayer. (Vt. Expt. Sta.). (*Canad. Dairy and Ice Cream Jour., 23 (1944), No. 8, pp. 25–26, 34*).—A discussion of methods of control and possible effects of mold growth on composite samples, essentially noted (E. S. R., 90, p. 91).

The effect of the method of manufacture of butteroil on its keeping quality, M. S. El-Rafey, G. A. Richardson, and J. L. Henderson. (Univ. Calif.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 807–820, illus. 4*).—Butter oil from butter heated to 110° or 130° C. to drive off moisture and the residue removed by centrifuging was more resistant to oxidative rancidity than when lower temperatures of drying or heating for 30 min. to 130° C. were employed. Washing the butter oil decreased its resistance to oxidation. High acidity had an undesirable effect on stability of the fat against oxidation and the destruction of vitamin A, but the differences were not significant. The sulfhydryl groups produced by the effect of heat on the protein part of the fat globule membrane and probably other reducing substances are transferred to the butter oil in the process of its preparation by the boiling-off method and there act as antioxidants. This may explain the high stability of boiled samples. As antioxidants, the activity of α-tocopherol was not proportional to the amount added from 0, 3, 9, and 15 mg. percent. The phosphorus content of the fat, calculated as lecithin, increased from 0.0073 percent in the filtered fat to 0.0805 in the heated fat, and the phosphorus content was directly correlated with its stability against oxidation. There was some synergetic action between α-tocopherol and soybean phospholipides when small amounts were added, but when the amount of phospholipide added was 0.10 percent, with various amounts of tocopherol, the protective action seemed due only to the presence of phospholipides.

Manufacturing Cheddar cheese from pasteurized milk, G. H. Wilster. (Oreg. Expt. Sta.). (*Amer. Butter Rev., 6 (1944), No. 10, pp. 340–343, illus. 3*).—A popular discussion of the advantages of using pasteurized milk for Cheddar cheese manufacture.

Testing for extraneous matter in cheese, R. Miersch and W. V. Price. (Univ. Wis.). (*Jour. Dairy Sci., 27 (1944), No. 10, pp. 881–895*).—Sediment tests in cheese are mainly designed to detect unsatisfactory conditions of milk and cheese production, except when efficient filtering of milk is practiced. Sediment after solution in either sodium citrate or orthophosphoric acid may be detected macroscopically or microscopically after filtering. Both solvents seemed to give about equal results, although the acid worked faster on young cheese. Neither solvent destroyed the extraneous material sufficiently to prevent identification, although more or less destruction was noted. The distribution of extraneous material seemed to be uniform in different samples from the same cheese, but not from several cheeses. Regular tests of plugs from each lot of cheese seem necessary. Microscopic examinations of extraneous material on the test pads may assist in determining the sources of contamination. Photographs proved helpful in identifying common types of extraneous material, although they were not to be used in place of microscopic study of materials from local sources.

The utilization of skim milk in the ice cream mix, W. S. Arbuckle, C. N. Shepardson, and H. M. Walling (*Texas Sta. Bul. 656 (1944), pp. 21, illus. 7*).—Study was made of the possibility of preparing and using concentrated skim milk as a source of solids for ice cream. In the manufacture of the concentrated product, 1 volume of concentrated hydrochloric, sulfuric, citric, acetic, or lactic acid was diluted with 9 volumes of water. The dilute acid was slowly stirred into the milk until there was a clean separation of the whey and curd. Various acidities of the whey from 0.43 to 0.52 percent were tested. The casein was completely precipitated at pH 4.6. The curd was dissolved by sodium bicarbonate, sodium carbonate, and a commercial alkali, and the acidity was adjusted to various levels from 0.2 to 0.6 for comparison of its relation to the most desirable product. The most success was obtained by coagulating the skim milk at 94°–96° F. with dilute hydrochloric acid and draining of the whey when 0.45–0.48 percent acidity is produced. The curd was dissolved by adding 5 lb. of sodium bicarbonate per 100 lb. of casein and heating to 150° for 30 min. Skim milk was added to the dissolved casein to produce a finished product containing 16 percent solids. The method used differs from that previously employed in that the quality and composition control was based on the use of the acidity tester, a casein test, and the hydrometer. The use of a cheese vat simplified the preparation and disintegration, and the heating of the curd brought about more rapid dissolving. Heating also reduced the bacterial count of the finished product to 50,000 or less. The use of skim milk instead of water to standardize the finished product offered a means of conserving nonfat milk solids. The approximate composition of the finished product was 84 percent water and 16 percent total solids.

It appears that 37.5 percent of the serum solids in the mix may be supplied by the concentrated skim milk in a 10-percent fat, 8-percent serum solids ice cream containing butter as a source of fat. When cream was used as the fat source, 10 percent of the serum solids needed could be furnished by the skim milk in a 10-percent fat, 8-percent serum solids mix. In a 12-percent fat, 9.6 percent serum solids mix, 20 percent of the serum solids could be supplied by the skim milk. As much as 50 percent of the serum solids needed in a 12-percent fat, 11-percent serum solids mix could be supplied by the skim milk product.

VETERINARY MEDICINE

[Miscellaneous contributions from California] (*Calif. Dept. Agr. Bul., 33 (1944), No. 3, pp. 155–167, 185–188, 195–205, illus. 4*).—In addition to an article noted elsewhere in this issue, this number contains the following: Fowl Pox, by E. E. Jones and D. Splaver (pp. 155–162); Vesicular Exanthema—An Attempt at Control, by B. B. White (pp. 163–166); Leukosis in Turkeys, by H. A. Hoffman (p. 167); Some Problems of Back Yard Poultry Raising, by E. E. Jones (pp. 185–188), devoted largely to problems of disease prevention and control; Gastro-Intestinal Round Worms in Cattle, by A. C. Rosenberger (pp. 195–197); and A Voluntary Program for the Control and Eradication of Pullorum Disease (pp. 198–205).

Isolation of the Bacillus anthracis from spinose ear ticks Ornithodorus megnini, G. W. Stiles. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 318–319, illus. 1*).—*B. anthracis* was isolated from a colony of spinose ear ticks, in various stages of development, attached to the ear of a cow dead of anthrax. This finding indicates that spinose ear ticks from anthrax carcasses may possibly spread the disease to healthy animals. Tick infested carcasses of animals dead of anthrax should, therefore, be promptly disposed of, and greater effort should be made by livestock owners to keep their herds free from spinose ear ticks because of the possibility of spreading disease.

Untersuchungen zur Frage der Desinfektion milzbrandinfizierter Materialien, mit besonderer Hinsicht der Desinfektion tierischer Haut [The disinfection of anthrax-infested material, especially hides], W. Hausam, R. Schnegg, and T. Schindler (*Zentbl. Bakt. [etc.], 1. Abt., Orig., 151 (1944), No. 3, pp. 193–219*). —Results of extensive tests with a large number of disinfectants are reported in tabular form. A mixture of sodium sulfocyanide, hydrochloric acid, and sodium chloride is recommended.

En förenklad färgningsmetod för undersökning av efterbördsprov (A simplified method of staining for the investigation of after-birth samples, A. Olson and B. Bodén (*Skand. Vet. Tidskr., 34 (1944), No. 7, pp. 416–422; Eng. abs., pp. 421–422*).—In the staining method described, *Brucella abortus* organisms are stained red, while spirilli, pyogenes bacilli, streptococci, staphylococci, and *Listerella* bacteria are stained dark blue.

The behaviour of some smooth and rough strains of Brucella abortus in the developing chick embryo, R. S. de Ropp (*Jour. Compar. Pathol. and Ther., 54 (1944), No. 1, pp. 53–60, illus. 2*).—The behavior in the 9-day-old chick embryo of one smooth and three rough strains of *B. abortus*, all of reduced virulence for the guinea pig, was compared with that of a smooth strain of high virulence for the guinea pig. It was found that the smooth avirulent strain (strain 19) behaved in the chick embryo as a fully virulent strain, causing death of a high proportion of the embryos with enlargement of the spleen and lesions in the liver. The three rough strains all proved incapable of producing a fatal infection in the chick embryo except when inoculated in very large numbers. The data suggested that rough strains of *B. abortus* are not capable of invading the chick embryo.

Consideraciones sobre la identificacion de los principales anaerobios del genero "Clostridium" patogenos para los animales domesticos [Identification of the principal anaerobes of the genus Clostridium pathogenic to the domestic animals], E. SÁENZ LONDOÑO (*Rev. Med. Vet.* [*Bogotá*], *13 (1944), No. 85, pp. 1–36*).—This is a discussion of methods of differentiation of the various species, with a bibliography of 27 titles.

In vitro action of sulfonamides on clostridia: Sulfonamide inhibitors, G. B. REED, J. H. ORR, and R. W. REED (*Jour. Bact.*, *48* (*1944*), *No. 2, pp. 233–242, illus. 2*).—Sulfonamides were found to exert an in vitro bacteriostatic action on all pathogenic species of *Clostridium* tested, the order of effectiveness being sulfathiazole, sulfadiazine, sulfapyridine, and sulfanilamide.

A study of certain members of the genus Corynebacterium, R. F. BROOKS and G. J. HUCKER. (N. Y. State Expt. Sta.). (*Jour. Bact.*, *48* (*1944*), *No. 3, pp. 295–312, illus. 1*).—A morphological, cultural, and physiological study of 79 cultures of organisms belonging to the genus *Corynebacterium* and originating from animal sources is reported, which has indicated the advisability of establishing broader limits for species in the classification of this type of organism. Although no high degree of correlation could be found between the characters studied, three main groups of animal diphtheroids have been defined by the use of cultural characters, as follow: Group 1, the *C. equi* or Active Group; 2, the Intermediate Group; and 3, the *C. pyogenes* or Inactive Group.

Diagnosing western equine encephalomyelitis infection: Comparison of neutralization and complement fixation tests, C. A. MITCHELL and J. W. PULLIN (*Canad. Jour. Compar. Med. and Vet. Sci.*, *8* (*1944*), *No. 9, pp. 259–260*).—In these tests on sera collected from humans in Manitoba, Ontario, and Quebec, the complement fixation test of Casals and Palacio did not give parallel results with the neutralization test, and the authors indicate that more work is needed before its acceptance as a specific technic for the diagnosis of encephalomyelitis in man or animals.

Susceptibility of animals other than solipeds to infectious anemia, C. D. STEIN and L. O. MOTT. (U. S. D. A.). (*Vet. Med.*, *39* (*1944*), *No. 11, pp. 408–413, illus. 1*).—Tests are reported with calves 5–8 mo. of age, lambs 3–4 mo., pigs 5 mo., dogs 18 mo., kittens 3–4 mo., young and large adult rabbits and guinea pigs, white rats, white mice, and pigeons. The results of these experiments indicate that the subcutaneous injection of a highly virulent strain of infectious anemia virus into calves, lambs, splenectomized pigs, and rabbits may be followed in some instances by temperature reactions and, in splenectomized or normal guinea pigs, by loss of weight, visible sickness, and even death. However, since none of the reacting animals developed the typical clinically recognizable syndrome of infectious anemia, post-mortem examination failed to reveal lesions indicative of infectious anemia, histological examination was negative for the presence of significant pathological alterations, and horse inoculation tests demonstrated that none of the reacting animals remained carriers of the virus, it was concluded that the virus did not reproduce itself in the heterologous host species and that none of the animals used were suitable for diagnostic test animals or satisfactory for carrying on other types of experimental work with the virus of equine infectious anemia. A list of 28 references is appended.

The incidence of pneumonia in some of the food-producing animals, R. F. LANGHAM, F. THORP, JR., E. T. HALLMAN, and L. B. SHOLL. (Mich. Expt. Sta.). (*North Amer. Vet.*, *25* (*1944*), *No. 9, pp. 541–542, illus. 1*).—Autopsies on

3,453 cattle, sheep, or swine from 1912 to 1941 revealed 1,187 cases in which pneumonia was found as either a primary or secondary condition. The incidence was higher in young animals, with a seasonal predominance during the spring.

A preliminary report of the use of lentin in atonic indigestion of dairy cattle, G. C. HOLM. (Idaho Expt. Sta.). (*Vet. Med., 39 (1944), No. 11, pp. 414–416, illus. 3*).—According to this preliminary report of 20 cases, doses of 1.5 to 2 mg. of lentin were found satisfactory when supported by tartar emetic, gentian, ginger, and mineral oil and, in dehydrated cases, water. The intramuscular method of administration was preferred. Prompt response was obtained. Therapy was indicated as soon as the condition was recognized. A delay of 24 hr. in treatment delayed recovery by about 7 days.

Milk production was restored more promptly and more completely than with the routine therapy.

Adenoma of the bovine bladder, R. F. LANGHAM, F. THORP, JR., and E. T. HALLMAN. (Mich. Expt. Sta.). (*Amer. Jour. Pathol., 20 (1944), No. 2, pp. 421–427, illus. 4; abs. in Michigan Sta. Quart. Bul., 27 (1944), No. 1 pp. 152–153*). —A microscopic study of the neoplastic tissue from two bovine bladders revealed adenomatous structures with mucin-producing, columnar epithelium. There was no evidence of infiltrative epithelial growth.

The relationship of teat patency to udder infection, J. M. MURPHY. (N. J. Expt. Stas.). (*Cornell Vet., 34 (1944), No. 1, pp. 64–68*).—This relationship was investigated, a manual method for the determination of patency being used. Circumstantial evidence was obtained that a trend exists toward a greater incidence of infection in quarters the teats of which were judged to be patent than in those the teats of which were judged to be nonpatent.

Adult vaccination studies: The effect of Brucella abortus strain 19 on cattle of various ages and its bearing on adult cattle vaccination, C. M. HARING and J. TRAUM. (Univ. Calif.). (*Holstein-Friesian World, 41 (1944), No. 19, pp. 21, 119, 122–123, 126, illus. 1*).—Observations on the incidence of brucellosis as influenced by the use of strain 19 on cattle of various ages under controlled experimental conditions, as well as in commercial dairy herds, are reported and discussed. It is concluded that, while far from being an ideal vaccine, strain 19 "is the only product at present that has been used on thousands of animals with any degree of satisfaction."

Calcium boro-gluconate-saccharate: Preparation, toxicity, and effect on serum calcium level in cows, A. APPLEBY. (Va. A. and M. Col.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 312–315, illus. 3*).—Calcium *d*-saccharate, selected as a source of calcium for use in lactating cows suffering from hypocalcemia, was found to be increased in solubility by boric acid, which reacts to form a compound to which the name calcium boro-saccharate has been given. A solution containing 10 parts boric acid, 37.5 parts calcium *d*-saccharate, and 100 parts calcium *d*-gluconate in 500 parts distilled water was found to be physically stable and less toxic for rabbits and no more toxic for cows, when injected intravenously, than a commercial solution of calcium boro-gluconate. The intravenous injection of either of these solutions into normal lactating cows caused an immediate marked rise in the serum calcium level. This rise was followed by a rapid drop, and, in the case of the C–B–S–G solution, a secondary rise about ½ hr. after injection. It is concluded that it would also be "more efficient than C–B–G solution in elevating and maintaining the serum calcium level in hypocalcemic cows."

Studies on johnin.—V, Producing and standardizing a potent product, H. W. JOHNSON. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 320–328, illus. 5*).—Continuing this series (E. S. R., 91, p. 337), a solid medium containing bovine lymph glands proved satisfactory for maintaining laboratory cultures of *Mycobacterium paratuberculosis.* Cultures transferred from this solid medium to Dorset and Henley's synthetic liquid medium grew slowly and unsatisfactorily. Johnin made from such inoculated medium was of unsatisfactory potency.

Six different liquid mediums on which cultures transferred from the solid lymph-gland medium grew vigorously were developed. Cultures were quite selective of the mediums on which their growth response was the greater. No one was satisfactory for all cultures.

Seed cultures which had been transferred several times on one or more of these "invigorating" liquid mediums would then grow for one, two, or three transfers to Dorset and Henley's liquid synthetic medium. Potent johnin was made from this inoculated synthetic medium.

The dry weight of organisms per culture flask and the trichloracetic acid precipitate per 10 cc. of intradermic johnin gave only relative estimates of the potency of the johnin, but were not in direct proportion to its potency. The pH of the medium became more acid during the early logarithmic phase of the growth curve and then alkaline as the negative growth acceleration phase was reached. A short lag phase and the production of maximum growth in 5 to 6 weeks after inoculation were found to yield more potent johnins.

Mastitis (garget) in dairy cattle, T. M. Olson and F. M. Skelton (*South Dakota Sta. Cir. 54 (1944), pp. 12, illus. 1*).—A popular account of this disease and its control.

Studies on bovine mastitis.—I, A note on clavacin therapy in bovine mastitis, E. H. Peterson and R. Graham. (Univ. Ill.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 316–317*).—Nineteen of the quarters of five cows were infused with various concentrations of crude and purified clavacin. Most of the quarters were shedding streptococci. In every instance, unrefined and refined clavacin proved to be irritating as indicated by connective tissue proliferation with or without symptoms of acute inflammation. The induced fibrosis was so marked in some cases as to destroy the function of the gland. In one cow which freshened subsequent to clavacin administration, the milk sinuses were so blocked by fibrotic tissue that little or no milk could be withdrawn. Infusions of clavacin did not, at the same time, materially affect the numbers of streptococci being eliminated in the secretion from the respective quarters. "On the basis of limited observations, clavacin proved unsatisfactory as a therapeutic agent in the treatment of bovine mastitis by udder infusion."

Partially purified penicillin in bovine mastitis, L. Minsky (*Calif. Dept. Agr. Bul., 33 (1944), No. 3, pp. 181–184*).—In tests of a group of 24 cows, 17 quarters were found to be infected with streptococci, 43 with staphylococci, and 4 with mixed streptococci and staphylococci. Penicillin was infused into the udders in varying amounts, forms, and strengths. The use of either crude or partially purified penicillin resulted in a marked decrease in the number of infectious organisms in the milk, and indicates that penicillin is "worthy of further investigation as a therapeutic agent in the treatment of bovine mastitis."

Phemerol in the treatment of 176 cows with chronic streptococcic mastitis, C. S. Bryan, L. P. Hedeman, E. E. Visger, and J. W. Cunkelman. (Mich. Expt. Sta.). (*Vet. Med., 39 (1944), No. 11, pp. 417–420, illus. 1*).—When 171 cows with chronic streptococcic mastitis having no marked induration of their udders were treated by infusing each quarter with 75 cc. of 1:1,000 aqueous solution of phemerol, 147 were freed of the infection. In most cows a transitory thickening (edema) of the mucous lining of the teat and milk cisterns resulted, and abnormal milk was produced for varying periods after treatment. Five cows with marked induration of their udders were similarly treated but failed to recover. The greatest decrease in milk flow as a result of the infusion occurred in cows in the early stages of lactation. It is recommended that cows be treated near the end of lactation, so that microscopic examinations will demonstrate recovery or the failure of the treatment before the onset of the dry period. The standard plate bacteria count of milk produced by 25 cows before treatment and upon recovery after treatment yielded reductions in bacteria count varying from 20 to 99 percent.

Pseudorabies of cattle, C. C. MORRILL. (Univ. Ill.). (*North Amer. Vet., 25 (1944), No. 9, pp. 539–540, illus. 2*).—A brief account of this disease.

A disease complex in calves on the north coast of California, J. W. BRITTON. (Univ. Calif.). (*Cornell Vet., 34 (1944), No. 1, pp. 30–37*).—A disease complex characterized by emaciation, parasitic gastroenteritis and bronchitis, pediculosis, or calf pneumonia is described as one of the most serious calfhood diseases on the northern California coast. Successful treatment has consisted of removing calves from the source of infection, treatment with phenothiazine for stomach worms, and increasing the feed allowance. Control has been based on pasturing the calves above the carrier cows, avoiding overcrowding, and treating twice a year with phenothiazine.

Experimental infections with Eimeria bovis in calves, D. M. HAMMOND, L. R. DAVIS, and G. W. BOWMAN. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 303–311, illus. 13*).—In six experiments, 15 calves previously uninfected with *E. bovis* and varying in age from 1 day to 2 mo., were inoculated with material containing from 1,000 to 1,000,000 oocysts of *E. bovis.* All the calves except one became infected, as evidenced by (1) discharge of *E. bovis* oocysts beginning on the sixteenth to twenty-first day following inoculation and (2) diarrhea and/or bloody diarrhea in all calves which received larger doses and some of the calves which received smaller doses. Excluding 2 calves which developed pneumonia, all 7 calves which received 125,000 oocysts or over developed marked symptoms beginning, in all calves except one, on the eighteenth day following inoculation, and 5 of these died or were killed in a moribund condition 24 to 27 days after the inoculation. A definite rise in temperature to a peak ranging from 104.4° to 106.6° F. occurred in each of the 7 calves during the time it was showing symptoms.

All the calves which died showed marked pathologic changes in the cecum and colon, and numerous oocysts of *E. bovis* in these regions. In most of the calves there was a relatively heavy discharge of oocysts for 5 or 6 days, beginning on the eighteenth to twentieth day following inoculation. Small numbers of oocysts were found in the feces for 2 to 3 weeks after the heavier discharge ceased.

Studies on the haematology of sheep.—I, The blood-picture of healthy sheep, H. H. HOLMAN (*Jour. Compar. Pathol. and Ther., 54 (1944), No. 1, pp. 26–40, illus. 2*).—Samples from 171 sheep were examined. A seasonal variation was observed in that during the spring of some years a significant decrease in hemoglobin occurred. No difference in the blood picture was proved between females and castrated males, resting animals and those just previously exerted, or among the different breeds used in the investigation.

The blood picture of "pining" conditions in sheep, J. STEWART and H. H. HOLMAN (*Jour. Compar. Pathol. and Ther., 54 (1944), No. 1, pp. 41–48*).—The blood picture of worm infestation, cobalt deficiency, and Solway pine disease was investigated, but the results did not give much promise that blood analyses will be of much service in differentiation.

Studies of sheep parasites, II, III, P. A. HAWKINS, C. L. COLE, E. E. KLINE, and J. H. DRUDGE (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 67–81, illus. 17; pp. 82–95, illus. 20*).—These papers continue the series (E. S. R., 91, p. 74).

II. *Winter treatment of the breeding flock.*—Results with 50 yearlings and 160 ewes and their lambs are reported, mainly by graphs, with the following conclusions: "Treatment with phenothiazine in the late fall is only beneficial if the animals are carrying relatively large numbers of parasites. Midwinter treatment with phenothiazine does not result in a lowering of the level of infection below that occurring in untreated animals. Midwinter cleaning of the pens results in a lower level of infection in the ewes in the spring. Treatment of the ewes with phenothiazine before going to pasture results in a lower level of parasitism in their lambs. Winter treatment with copper-nicotine sulfate is not justified."

III. *Treatment of the lambs.*—These results are reported mainly in graphs. The following conclusions are drawn: "Phenothiazine in the salt, copper-nicotine sulfate, or tetrachlorethylene in soft gelatin capsules did not remove roundworms, under conditions of this experiment. Phenothiazine as a drench was very efficient in removing roundworm parasites and maintaining the infection at a low level, but not in eliminating it. Copper-nicotine sulfate, tetrachlorethylene capsules, or a phenothiazine drench, given at 4-week intervals, interfered with weight gains."

Recommendations for the control of roundworm parasites of the gastrointestinal tract are given, as follows: "Bed ewes well during winter. Clean and rebed the barn, preferably twice during the winter. Drench ewes with phenothiazine, and place both ewes and lambs on a mixture of 1 part of phenothiazine and 14 parts of salt 3 to 4 weeks before going to pasture. Keep this mixture before the flock while on pasture. Watch flock for any evidences of parasitism while on pasture. If these occur drench individuals with phenothiazine, still allowing the salt mixture."

Field tests with fixed nicotine for the control of "sheep ticks," Melophagus ovinus, N. G. COBBETT and C. E. SMITH. (U. S. D. A.). (*North Amer. Vet., 25 (1944), No. 9, pp. 536–538*).—These tests were carried on independently in two New Mexico range flocks and three Colorado farm flocks to study possible available substitute materials for derris (E. S. R., 89, p. 590). Dips composed of 2 lb. of the fixed nicotine product to 100 gal. of unheated water, replenished as needed and supplemented with 10 lb. of wettable sulfur per 100 gal. of dip, did not eradicate sheep ticks in a single dipping and "cannot be considered a satisfactory substitute for either derris or cube." The dips immediately killed most of the ticks present at the time of dipping, but had little effect upon those that subsequently emerged from pupae remaining in the wool. The nicotine content of the dip remained constant throughout the dipping process, and post-dipping observations showed no greater effectiveness from the freshly prepared dip.

Sulfur prophylaxis of coccidiosis of feeder lambs, J. F. CHRISTENSEN. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 341–345*).—Commercial flour sulfur, in portions ranging from 0.5 to 3.0 percent of the total ration, effectively prevented the development of naturally acquired clinical coccidiosis in 800 lambs. In portions greater than 1.5 percent, the laxative effect of the sulfur was an objectionable feature, and weight gains did not compare favorably with gains in the control lambs.

No visible ill effects were noted in lambs after 72 days of continuous feeding of sulfur in amounts ranging from 0.5 to 1.5 percent in the ration. The death rate from all causes was remarkably low and compared favorably with untreated control animals in rate of fattening. Feeding sulfur in these low percentages is deemed decidedly practical, in view of its availability and low cost.

Brucellosis of swine.—II, Eradication by blood test and segregation. III, Studies on the diagnostic titer in the individual, H. S. CAMERON and P. A. CARLSON. (Univ. Calif. coop. U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 329–332, 333–336*).—Continuing this series (E. S. R., 89, p. 366), a program of eradication is reported as attempted in two herds. This program as presented in part 2 is as follows: "Blood test the brood stock. If infection is present, do not attempt to salvage nonreacting sows, but consider the unit as infected. Segregate young pigs at weaning. At breeding age, blood test and breed to a noninfected boar only those gilts negative at 1:25. As replacements become available, cull infected stock." Although the disease was not eradicated from every herd, the freedom of the young pigs from infection showed that the program would be applicable in most situations and that the disease could be eradicated by segregating these pigs at weaning.

Evidence is presented in part 3 which indicates that a negative agglutination test even in serum dilution of 1:6.25 does not mean freedom from brucellosis in the individual pig in an infected herd. Positive blood cultures were obtained in experimentally infected pigs negative for agglutinins at 1:6.25. "The agglutinating titer must be interpreted with respect to the herd history, particularly the trend in titers. An initial titer of 1:6.25 is more dangerous than a receding one of 1:50. In an eradication or purchase program involving the agglutination test, emphasis must be on the unit as a whole, not on the individual pig. If infection exists, the entire unit should be considered infected. Animals negative to the test should not be selected as noninfected from such a herd until repeated tests indicate that spread is not active in the group."

Influence of B vitamins, liver, and yeast on induced necrotic enteritis in swine, R. A. Rasmussen, H. J. Stafseth, V. A. Freeman, and M. J. Miller. (Mich. Expt. Sta.). (*Vet. Med., 39 (1944), No. 11, pp. 421–423*).—Necrotic enteritis of hogs was produced by administering *Salmonella choleraesuis*. A more severe reaction was secured when the culture was mixed in the feed than when given as a drench. Many hogs died from the initial attack of the disease regardless of the nutritional regimen, but during the recovery period nicotinic acid and some principle or principles present in liver but not in sufficient quantities in yeast were of benefit by promoting increased weight gains and decreasing the length of the recovery period. It is concluded that a composite of known B vitamins may give a better response than nicotinic acid alone in the recovery phase of the disease.

Chronic focal interstitial hepatitis in the pig: Its experimental production by feeding Ascaris eggs, J. N. Oldham and E. G. White (*Jour. Compar. Pathol. and Ther., 54 (1944), No. 1, pp. 1–15, illus. 13*).—After feeding 20 pigs 8–11 weeks old, with from 200,000 to 400,000 embryonated *Ascaris lumbricoides* eggs, lesions were produced identical with the various types found in the naturally occurring condition of "milk spot liver" (chronic focal interstitial hepatitis). The etiology of this condition, both natural and experimental, is ascribed to the migration of *Ascaris* larvae in the liver. The eosinophilia which followed single and repeated doses of eggs was studied. It is emphasized that a wider adoption of, and stricter attention to, control methods against *Ascaris* would successfully reduce the losses which ensue from roundworm infestation.

Smittvägarna vid svinpest (Paths of infection in hog cholera), H. Hedström (*Skand. Vet. Tidskr., 34 (1944), No. 7, pp. 385–415, illus. 5; Eng. abs., pp. 414–415*).—The author discusses possible channels of infection into and within Sweden and the tenacity of the virus. In epizootic attacks in Sweden in 1940 and 1943, the most important avenues were through infections by garbage and the movements of live animals, although there were some cases of needle-infection and by persons, rats and birds, and virus-infected grain bags. Imports of salt pork and other contaminated articles are deemed probable paths of entry from abroad.

Experiments with crystal-violet vaccine for the prevention of hog cholera, C. G. Cole. (U. S. D. A.). (*Iowa Vet., 15 (1944), No. 3, pp. 16–20*).—In this address recent tests with this vaccine are described and its advantages and disadvantages discussed.

Estimation of platelet fragility, M. E. Muhrer, R. Bogart, and A. G. Hogan. (Univ. Mo.). (*Amer. Jour. Physiol., 141 (1944), No. 4, pp. 449–453, illus. 2*).—The purpose of this investigation was to devise an objective method of measuring the fragility of blood platelets, and to compare the fragility of the platelets in bleeder and in normal swine blood.

According to the findings, the coagulation time of platelet-containing plasma is sharply reduced on dilution with hypotonic salt solution. Bleeder plasma coagulates at the same rate as normal plasma at the lower salt concentrations. It is assumed as a tentative explanation that bleeder platelets are more resistant to hypotonic salt solution than are normal platelets. When they do disintegrate they may release as much thromboplastin as do normal platelets. The coagulation time of cloudy plasma, when made hypotonic, is an index of platelet fragility.

See also a previous note (E. S. R., 88, p. 323).

Action of chemical and physical agents on the virus of equine infectious anemia, C. D. STEIN, O. L. OSTEEN, L. O. MOTT, and M. S. SHAHAN. (U. S. D. A.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 291–302*).—The experiments recorded were carried out primarily to obtain information that would assist in safeguarding veterinary and human biological products prepared from horses from possible contamination with the virus of equine infectious anemia. On the basis of the results, it is concluded that the virus shows considerable resistance against chemical disinfectants and other external influences such as heat, freezing, and desiccation. It is dialyzable. It is little affected by age, slowly losing its activity when stored in the refrigerator at 5° C.

Freezing, drying, and lyophilization are effective methods for preserving the stability of the virus. Formalin has fairly strong virucidal action, phenol is moderate in this respect, and chloroform is weak.

"The virus contained in equine antiserums can be inactivated by holding it at a temperature of at least 58° to 59° for 1 hr., by certain chemical preservatives in proper concentration, or by the combined processes of fractionation, heating, and dialysis used in refining certain antiserums.

"Tissues from horses affected with infectious anemia inactivated or attenuated by treatment with chemicals, heat, or other means have no value as immunizing agents."

Natural occurrence of tularemia in dogs used as a source of canine distemper virus, H. N. JOHNSON (*Jour. Lab. and Clin. Med., 29 (1944), No. 9, pp. 906–915*).—The isolation of *Bacterium tularense* from dog spleen tissue used for the production of canine distemper vaccine is described. Attention is called to the danger of spreading lymphocytic choriomeningitis and tularemia through the medium of contaminated live virus-canine-distemper vaccine prepared from dog spleen. Dogs and cats regularly develop a systemic infection following inoculation with a suspension of tissue infected with *B. tularense*. The organism shows a special affinity for the upper respiratory tract in both species. Puppies are more susceptible than mature dogs. Mature dogs, injected intracerebrally, develop a fulminating meningoencephalitis with a 100-percent fatality. *B. tularense* was found to persist for as long as 25 days in the nasopharynx of dogs infected by intranasal inoculation. The organism was also recovered from the nasal secretion of dogs infected by feeding infected animal tissue, and from the lungs of dogs and cats inoculated subcutaneously. Baby chicks are susceptible to infection with *B. tularense*, and the organism grows readily in a tissue culture medium of chick embryo tissue and serum Tyrode's solution.

An unidentified organism was found in blood cultures of dogs which closely resembled *B. tularense* in morphology and cultural characteristics but was not antigenically related to either *B. tularense* or *Brucella bronchisepticus*.

Bibliography of poultry diseases (*Bibliog. Poultry Diseases, Lab. Workers Pullorum Disease Control* [*New Brunswick, N. J.*], *9 (1944), No. 1, pp. 12+*).—This issue of this bibliography (E. S. R., 91, p. 597) contains 125 titles.

The serial passage of an avian lymphoid tumor of the chicken, C. OLSON, JR. (Mass. Expt. Sta.). (*Cancer Res., 4 (1944), No. 11, pp. 707–712, illus. 6*).—This report deals with changes in growth capacity of a lymphoid chicken tumor previously noted (E. S. R., 86, p. 538) during the course of its serial passage over a period of 3 yr. The following conclusions are drawn:

The reaction of a chicken after receiving an implant of the lymphoid tumor herein described will vary, depending upon the activity potential of the tumor and the resistance of the host. In ascending order of severity these reactions are failure of the graft, growth and regression, progressive local growth only, growth with localized metastasis, and growth with diffuse metastasis. Serial transfer of the tumor enhanced its ability to produce the more severe reactions. Transfer of the tumor at 10-day intervals was more effective in raising the growth activity of the tumor than transfer at 15-day intervals.

The isolation of the St. Louis encephalitis virus from chicken mites (Dermanyssus gallinae) in nature, M. G. Smith, R. J. Blattner, and F. M. Heys (*Science, 100 (1944), No. 2599, pp. 362–363*).—The virus was isolated from mites collected in the St. Louis area during a nonepidemic period. The source was a coop in which there were chickens whose sera had been shown to have neutralizing antibody for the virus.

The neutralization in vitro of avian pneumoencephalitis virus by Newcastle disease immune serum, J. R. Beach. (Univ. Calif.). (*Science, 100 (1944), No. 2599, pp. 361–362*).—In these tests, chickens 61 days old were not infected by inoculation with 1,000 infective doses of pneumonencephalitis virus when it was mixed with an equal quantity of undiluted or 1:10 or 1:100 dilutions of Newcastle disease immune serum. The virus was not affected, however, by mixing it with the fowl plague immune serum. These results indicate that the virus of pneumoencephalitis is immunologically identical with the virus of Newcastle disease.

AGRICULTURAL ENGINEERING

Surface water supply of the United States, 1942.—Parts 5, 6 (*U. S. Geol. Survey, Water-Supply Papers 955 (1944), pp. 402+, illus. 1; 956 (1944), pp. 482+, illus. 1*).—Results of measurements of stage and flow made on streams, lakes, and reservoirs during the water year ended September 30, 1942, are given in part 5 for the Hudson Bay and upper Mississippi River basins and in part 6 for the Missouri River basin.

Summary of records of surface waters at base stations in Colorado River Basin, 1891–1938, W. E. Dickinson (*U. S. Geol. Survey, Water-Supply Paper 918 (1944), pp. 274+, illus. 12*).—This report presents summaries of records of discharge at a series of key points in the Colorado River Basin known as "base stations," and contains a bibliography of all published records for the base stations. Full data of yearly discharge are given for both the water year ended September 30 and the calendar year.

[Columbia River Basin snow surveys and irrigation water forecasts as of April 1, 1944] (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, pp. 29+, illus. 2*).—It is predicted that, unless compensating rainfall occurs during the coming growing season to make up for the indicated deficiency of runoff from snow cover, approximately 900,000 of the 3,828,000 acres of irrigated land in Columbia Basin will suffer midsummer and late season water shortage, amounting to 25 to 30 percent of the season's supply. Pastures, fruits, and late row crops will be most seriously affected. A runoff approximating that of 1931 (one of the smallest during recent years) and poorly sustained August and September streamflow were also in prospect.

Snow surveys and irrigation water forecasts for the Rio Grande drainage basin. (Coop. Colo. Expt. Sta.). (*U. S. Dept. Agr., Soil Conserv. Serv., 1944, Mar., pp. 3; Apr., pp. 3; May, pp. 5*).—The irrigation water supply for the 1944 season is forecast, as of the date of May 1. Reservoir storage data in the general Rio Grande area are also tabulated as of the date of May 1 for the years 1935 to 1944, inclusive.

Water levels and artesian pressure in observation wells in the United States in 1942.—Part 3, North-Central States, O. E. MEINZER, L. K. WENZEL, ET AL. (*U. S. Geol. Survey, Water-Supply Paper 946 (1944), pp. 278+, illus. 11*).—This part covers the States of Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Improvement of flood-damaged land in eastern Oklahoma, H. J. HARPER (*Oklahoma Sta. Bul. 267 (1944), pp. 28, illus. 8*).—A large area of productive land in the Arkansas River Valley between Fort Gibson, Okla., and Fort Smith, Ark., was severely damaged from two major floods in May 1943. This bulletin contains information obtained from physical and chemical analyses of soil samples and from field observations. It also describes the soil treatment required to improve the crop-producing capacity of alluvium deposited on previously productive soils, suggests crops adapted to the present surface conditions, and indicates how cropping systems might be adjusted to reduce future flood damage.

The jeep as a farm truck-tractor for the post-war period, L. J. SMITH and O. J. TRENARY (*Washington Sta. Bul. 445 (1944), pp. 19+, illus. 9*).—Special features of "jeep" design which may be advantageous in farm work include optional front axle drive, which may be thrown into gear when required to secure a maximum traction, heavy chains for adverse soil conditions, low center of gravity (21 in. above the road surface and 41.5 in. in front of the rear axle), 1-ton trailer box of all-steel construction with an endgate that swings down to facilitate loading, together with wooden rack 21 in. high with cross bows, and tarpaulin to cover the load, available with the trailer. A 15-in. wheel is hinged to the vehicle. When not in use it can be fastened up off the ground with an automatic catch.

Road fuel economy trials gave mileage figures ranging from 25 miles per gallon at 20 miles per hour without load to 11.9 miles per gallon with 3,000-lb. load at 45 miles per hour on asphalt road. Decrease in weight borne by the front wheels due to upward angle of hitch, very important when the four-wheel drive is in use, was found to range from 2.7 lb. with 100-lb. hitch pull and angle of 5° to 126.4 lb. with hitch pull of 800 lb. and hitch angle of 30°. Maximum load tests with a sled having 4- by 6-in. runners sliding upon a level surface of very hard clay gave the figures 855 lb. pull and 4.5 miles per hour speed. The efficiency of the vehicle in hauling baled hay in harvesting and hauling apples and in general early spring farm work was also tested.

Some of the general conclusions were that the jeep can serve as a source of reserve power for use in the field during the spring work; that on farms using a tractor it can pull one of the lighter implements while the tractor is used on another type of implement; that the jeep is too low and has too long a turning radius for use in cultivating most crops, but can be used to advantage with the trailer for transportation from farm to market or warehouse. The maximum horsepower of the motor can not be obtained under average agricultural conditions. The operating speed under those conditions is considerably less than that at which the maximum horsepower is obtained. A lower gear ratio would increase the available horsepower.

Two-torque differential to solve steering problem, A. W. CLYDE (*Pennsylvania Sta. Bul. 464 (1944), p. 3*).—An unequal torque differential devised last year was put into a full-sized farm tractor and tested in plowing. It is believed to offer a solution of the problem of steering control and traction of wide-tread tractors in plowing in the operation of implements on hillsides.

Studies on use of liquid in tractor tires.—I, Effect on traction and change of pressure with variation in weight carried by tires, E. C. SAUVE and E. G. MCKIBBEN (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 16–25, illus. 8*).—The percentage of liquid fill had no significant effect on the traction capacity of a tractor tire when the inflation pressure and total weight carried were the same. Other conditions remaining the same, the traction capacity of a tractor tire is approximately proportional to the total weight carried by it. Insofar as weight is added, increasing the percentage of liquid fill will therefore increase the traction capacity. Lower inflation pressures materially improved the traction capacity of tractor tires. Other factors remaining the same, increasing tire cross section improved the traction capacity.

The deflection for the same inflation pressure at the bottom of the tire and the same total weight appeared to be slightly less for 100-percent liquid-filled than for air-filled tires. From the standpoint of performance, however, the difference was not significant. At constant temperature, the increase of pressure with increase of weight carried was much greater with 100-percent liquid-filled tires than with air-filled tires. This increase in pressure was not, however, enough to meet the recommendations of the Tire and Rim Association. Preliminary tests indicated a much lower loss of inflation pressure by diffusion from 100-percent liquid-filled tires.

A homemade portable chain drag elevator, J. P. FAIRBANK, O. C. FRENCH, L. W. NEBUAUER, and H. L. BELTON (*Calif. Agr. Col. Ext. Serv., 1944, rev., pp. 4, illus. 10*).—Drawings and reproductions of photographs illustrate the construction of a medium-sized chain drag elevator of which the leg or trunk, flights, frame, and bearings are of wood. The design is to meet the present emergency. The trunking later may be lined with sheet steel, and regular elevator bearings and steel flights used to replace those now made of wood. The elevator trunking is of a combination box and H beam section which gives rigidity such that trussing is not needed for lengths up to 32 ft. The material may be either vertical grain Douglas fir screwed and bolted or ½-in. exterior grade plywood held by screws and waterproof glue. The bearings are hardwood, maple preferably, but oak will serve. Oak is recommended for the flights, but tests indicate that plywood has good wearing qualities for this purpose. The drag chain is either malleable or steel detachable link, No. 52, No. 55, or No. 62, sizes commonly used in combines. Suitable attachment links, if unavailable, can be improvised by welding bolts or plates onto standard steel links, brazing to or malleable links. Other constructional and operational detail is supplied.

The Michigan vertical cup-type elevator for small grain and shelled corn, D. E. WIANT and W. H. SHELDON (*Michigan Sta. Cir. 193 (1944), pp. 32, illus. 32*).—The design here described is based upon experimental work carried on at Michigan State College and upon information obtained by working with home-built elevators, some of which have been in use on Michigan farms for 10 yr. It can be built by the ordinary farm mechanic with common tools and at a reasonable cost. The parts and materials are easily obtained. There are few critical measurements. It is claimed that it will elevate approximately 300 bu. per hour when equipped with 3.5 by 3 in. cups, spaced 6 in. apart, at a belt speed of 300 ft. per minute, and 400 bu. when a 5-in. belt equipped with 4.5 by 3 in. cups is used at the same speed. It will maintain its efficiency throughout a wide range of conditions.

The bulletin contains all necessary drawings and full directions for construction, together with reproductions of photographs of the completed elevator and of many of its parts. One of these illustrations shows an experimental form of the elevator mounted upon caster-type wheels so that it may be moved about from one point of operation to another.

A homemade bale loader, J. S. WINTERS and J. P. FAIRBANK (*California Sta., 1944, rev., pp. 7, illus. 21*).—Constructed mainly from noncritical materials and old automobile parts, this loader can be built by farmers or by others who have access to a welding outfit and a lathe. It is ground-driven. Its drive may be made from two old automobile rear axles. A Ford V–8 rear axle carries the loader and drives a countershaft made up from parts of a Ford model A rear axle. These axles were selected because the torque tube and radius rods of the V–8 make a simple and rugged support for the countershaft, bale chute, and platform, and the two axles can be combined with a minimum of shopwork. The bale chute and platform are made of wood; the hitch bars and all braces, from standard black pipe. Accompanying photographs and drawings illustrate the various parts and show how they are assembled to make a traction-driven bale loader that slides the bales up a chute by means of a single chain (assisted by two short pick-up chains at the lower end of the chute). Constructional detail is given. Working drawings and a bill of materials accompany the text. It is stated that the total cost of parts and materials should be under $90, assuming the price of the two automobile rear ends and wheels to be as much as $35. This revision includes simplification and improvements developed as a result of a year's observations of the performance of the loader in the field.

AGRICULTURAL ECONOMICS

Cornell University abstracts of theses, 1943 (*Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 463, illus. 1*).—Included are abstracts of the following theses in agricultural economics and rural sociology accepted in 1943 by Cornell University in partial satisfaction of the requirements for the doctor's degree: Social Class as a Factor in the Family Group Relations of Certain New York Farm Families, by E. J. Freeman (pp. 130–133); The Social Status of Rural Households Living in Three Selected Low-Income Areas of New York State, 1940, by G. T. Hudson (pp. 134–137); Prices Paid by Vermont Farmers for Goods and Services and Received by Them for Farm Products, 1790–1940, Wages of Vermont Farm Labor, 1780–1940, by T. M. Adams (pp. 361–364) (E. S. R., 91, p. 608); Consumer Demand for Meat, Syracuse, New York, 1942, by R. H. Anderson (pp. 365–369); Costs and Returns in Producing Milk in Five Areas in New York, 1939–40, by I. R. Bierly (pp. 370–374) (see p. 425); An Economic Study of Agriculture in Shelby County, Kentucky, by J. H. Bondurant (pp. 375–378); The People and Their Use of Land in Nine Vermont Towns, by R. M. Carter, Jr. (pp. 379–382); Commercial Poultry Farming in New York State, by L. B. Darrah (pp. 383–386) (E. S. R., 90, p. 541; 91, pp. 754, 755); An Economic Study of Low Income Rural Areas in New York, 1940, by L. S. Hardin (pp. 387–390); An Economic Study of Farms Operated by Negroes in Dallas County, Alabama, by E. N. Hooker (pp. 391–394); and Regional Markets in Up-State New York, by V. H. Nicholson (pp. 395–398) (E. S. R., 91, p. 608).

Publications: Department of agricultural economics and rural sociology (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 60, rev. (1944), pp. 29+*).—This classified list (E. S. R., 90, p. 259) is of November 1, 1944.

Current Farm Economics, [October 1944] (*Cur. Farm Econ. [Oklahoma Sta.], 17 (1944), No. 5, pp. 129–149+, illus. 1*).—Included are a discussion of the general agricultural situation, including the real estate, crop, livestock, and livestock production situations; the usual tables of prices and price indexes; and an article, "Absentee" Landlords, by R. T. Klemme (pp. 137–143), with tables showing numbers of, average size, and average productivity of farms in Creek, Garfield, Johnston, and Kiowa Counties, owned or operated by owners, cash tenants, and other tenants living in the county, outside the county but in the State, and outside the State. Another article included is on the Purchase of Livestock by Oklahoma Farmers, by A. L. Larson (pp. 144–149), with tables and chart showing the sources of the purchases of cattle and calves, hogs and pigs, and sheep and lambs.

An application of the variate difference method to multiple regression, G. Tintner. (Iowa Expt. Sta.). (*Econometrica, 12 (1944), No. 2, pp. 97–113,* *illus. 3*).—This article discusses the problem of fitting regression equations if all variables are subject to error and presents a new solution with the help of the variate difference method. The procedure is illustrated by the fitting of a Douglas type[1] production function for American agriculture, 1920–41. The annual data used are from the Barger and Landsberg book noted below.

American agriculture, 1899–1939: A study of output, employment, and productivity, H. Barger and H. H. Landsberg (*Natl. Bur. Econ. Res. [New York] Pub. 42 (1942), pp. 440+, illus. 47*).—Part 1 (pp. 3–15) "describes some peculiarities of agricultural enterprise and furnishes a definition of agricultural output." Part 2, Output (pp. 19–189), deals with the behavior of agricultural output, the output of individual products, and agriculture and the nation's food. Part 3, Employment and Productivity (pp. 193–287), reviews the history of technological changes in agriculture and the extent of innovations adopted in different areas, makes estimates of agricultural employment, and estimates the trends in output per worker, the direct labor requirements and yields per acre of different crops, and the agricultural productivity. Part 4 (pp. 291–321) gives the authors' conclusions and discusses their bearing upon the outlook for agriculture as a segment of the economy of the nation.

National Resources Development Report for 1943.—I, Post-war plan and program (*Washington: [U. S.] Natl. Resources Planning Bd., 1943, pp. 81+*).—Some of the plans "both for the transition period immediately following the cessation of hostilities and for the longer range period of post-war development of our expanding economy," are brought together.

Farm land values and the war (*U. S. Dept. Agr., The Farmer and the War, No. 1, rev. (1944), pp. 8, illus. 3*).—A revision (E. S. R.. 88, 270).

Range land objectives and problems in the postwar period for Idaho (*Idaho Sta. Cir. 93 (1944), pp. [4]*).—A tentative outline of objectives and a description of the problems.

Suggestions to prospective farmers. (Coop. U. S. D. A. et al.). (*Washington Sta. Pop. Bul. 178 (1944), pp. 12, illus. 6*).—A popular bulletin prepared by the Land Settlement Subcommittee of the Washington Committee on Post-war Programs for Agriculture. Colored maps included show the preliminary economic land classification of King County and the types of farming in the State in 1944.

Foreign Agriculture, [October-November 1944] (*U. S. Dept. Agr., Foreign Agr., 8 (1944), Nos. 10, pp. 213–240, illus. 3; 11, pp. 241–268, illus. 5*).—No. 10 includes an article, Agriculture in Guam, by R. G. Oakley (pp. 215–224), describing the natural resources, the agriculture, and agricultural potentialities; and an article, Agriculture and Food in the Netherlands, by L. E. Butt (pp. 225–240), discussing the climate and land, agricultural regions, size and tenure of farms, means of production, the livestock and crops, horticultural products, food supply, and agriculture and food in the war period.

No. 11 includes three articles as follows: The Mexican Beef-Cattle Industry, by M. G. Smith (pp. 243–265), discussing the developments of the industry, the production and factors affecting it, domestic consumption, exports, prices, methods of domestic and export marketing, credit and financing, livestock organizations, and educational and extension activities; Legislation in Tanganyika Affecting Crop Production, by L. Corder (pp. 266–267); and Canadian Act to Support Agricultural Prices (pp. 267–268), summarizing the main provisions of the Act for the support of the prices of agricultural products during the transition from war to peace that became law on August 15, 1944.

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[1] The Theory of Wages, P. H. Douglas. New York: Macmillan Co., 1934, pp. 639+, illus. 90; and many other articles, e.g., Further Measurements of Marginal Productivity, G. T. Gunn and P. H. Douglas, Quart. Jour. Econ., 54 (1940), No. 3, pp. 399–428, illus. 2.

Brazilian land surveys, land division, and land titles, T. L. SMITH (*Rural Sociol., 9 (1944), No. 3, pp. 264–270; Span. abs., p. 264*).—"Brazilian land patterns are based almost exclusively in natural phenomena, hence they contrast sharply with the geometrical arrangement of the cultural landscape in the United States. Portugal allowed the colonial population to establish itself on the land, guided only by the wishes and convenience of the individual. With the establishment of the Republic in 1889, rights to the public lands were transferred to the States. In south Brazil a modified version of the river front land division has developed during the last century. This has now been perfected to a high degree and must be rated as superior among all the systems man has devised for dividing the earth's surface among farm families."

Economic problems in Mississippi and the South, F. J. WELCH (*Mississippi Sta. Spec. Cir. 2 (1944), pp. 11*).—A general discussion of the agricultural and industrial relationships; national, regional, and State problems; population pressure on farms; diversification, etc.; and the future of cotton.

Economic and cost study of cotton ginning in central Mississippi, D. G. MILEY and A. L. ROBERTS. (Coop. U. S. D. A.). (*Mississippi Sta. Bul. 403 (1944), pp. 29, illus. 2*).—This study of the influence of ginning machinery and equipment on the costs of ginning and quality of cotton is based chiefly on data for 10 modern, 15 average (equipped to do fair ginning), and 18 substandard gins in an area in four counties. Most of the gins were in one-variety-cotton communities, and the cotton was classified by the Department. The general characteristics of the gins and transportation to gins are described. Analysis is made of the different current expenses, salaries of managers, investment costs, fees for ginning, profits on gin operation, net receipts from cottonseed and bagging and ties, and net income from labor and to the gins, total and per bale for the three types of gins. The influence of size of gins, volume ginned, use of labor and capital, and power costs on ginning income, and the factors affecting cotton quality are discussed.

Total cotton production in the State increased approximtely 251,000 bales, 16.4 percent, from 1906 to 1943, but the number of active gins decreased from 3,780 to 1,227. From 1928–30 to 1939–41 the percentage of cotton graded above Middling decreased from 55 to 19 percent. The average total costs, fees from ginning, profit on ginning operation, net income from cottonseed, net income from bagging and ties, and net profit per bale, respectively, for the modern, average, and substandard gins were: $3.15, $3.48, and $3.44; $3.26, $3.50, and $3.47; 11 ct., 2, and 3 ct.; 98 ct., $1.00, and 78 ct.; 25 ct., 26, and 25 ct.; and $1.34, $1.28, and $1.06.

Cost of raising dairy heifers in New York, L. C. CUNNINGHAM (*[New York] Cornell Sta. Bul. 807 (1944), pp. 10, illus. 3*).—The bulletin is based on data obtained in connection with studies of the costs of production of milk on about 100 farms in four counties (Orange, Chenango, Cayuga, and St. Lawrence) in 1930-31, on 542 farms in the same four counties noted above and a fifth county (Cattaraugus) in 1939-40, and other studies in the State. Analysis is made of the feed and labor requirements and relative importance of different factors.

Approximately 1,000 lb. of concentrates, 2 tons each of hay and silage, 750 lb. of milk, and 40 hr. of man labor were required to raise a dairy heifer to 2 yr. of age. Feed constituted about 75 percent and labor 12 percent of the cost. Under most conditions in the State the whole dairy-farm business pays better when heifers are raised. The cost of raising a heifer up to the time of freshening, with 1939–40 prices, was $90 as compared with $115 in the twenties.

Factors that affect costs and returns in producing milk, I. R. BIERLY (*[New York] Cornell Sta. Bul. 804 (1944), pp. 41, illus. 8*).—Farm business records and detailed data as to costs and returns for the year ended April 30, 1940, obtained by the survey method for 102 to 117 farms each in Orange, Chenango, Cayuga, St.

Lawrence, and Cattaraugus Counties are analyzed to show the returns from farming; costs and returns in producing milk; and the effects of different factors on costs and returns of milk production per cow, seasonality of production, size of cows, size of business, labor efficiency, crop index, etc.

Average labor income per farm ranged from $298 to $700 in the several counties. In general, feed constituted more than 50 percent and labor more than 25 percent of the cost of producing milk, the two combined being about 80 percent. Amount of milk produced per cow was the most important factor affecting costs and returns. For the five areas only about one farm in nine was equal to or exceeded the average for the area in the four most important factors affecting profits—rate of milk production, size of business, labor efficiency, and crop yields. These farms produced milk at about 40 ct. per 100 lb. less cost than the average, and the average labor income per farm was $900 higher than the average for the counties, except in Cattaraugus County where it was more than $800.

An economic study of Washington's turkey industry in 1942.—I, Breeding flocks, C. N. BERRYMAN and M. T. BUCHANAN (*Washington Sta. Bul. 440 (1944), pp. 19, illus. 6*).—Analysis is made of the data for 61 breeder flocks as to the costs of producing hatching eggs and poults in production records obtained from 169 turkey growers in the Yakima Valley and Clark and Island Counties. The variations in feed consumption, man labor, egg production and fertility, and costs of producing hatching eggs in flocks of different sizes; the relation of type of ration fed to egg production, fertility and costs and of hen-tom ratio to fertility and salable poults; and costs of producing hatching eggs and poults are discussed.

The average costs of production were 14.5, 14.8, and 21.5 ct. per hatching egg and 39.1, 35.2, and 44.6 ct. per salable poult in Island County, the Yakima Valley, and Clark County, respectively. Pounds of feed per bird and investment for breeder flocks of the same size did not vary greatly among the areas. As breeder flocks increased in size, less feed and labor were required per breeder and more eggs and poults were produced at lower costs. The optimum results were obtained when about equal amounts of mash and grain were fed. Little variation in fertility of eggs was found between flocks with less than 9 hens per tom and those with more than 10½ hens. There were significantly more salable poults in flocks where the toms were rotated than in those where they were not.

Washington apple production costs during the 1943–44 season, M. T. BUCHANAN (*Washington Sta. Bul. 446 (1944), pp. 14, illus. 1*).—Analysis is made of data from 180 producers, chiefly in the Wenatchee-Okanogan and Yakima districts, obtained mostly through survey records filed by them, to show the average 1943 production costs, the variations in such costs, the factors causing the variations, and the changes in cost, 1939–43 (E. S. R., 89, p. 738). Estimated costs for 1944 are briefly discussed.

Average cost of growing and harvesting was $1.44 per box, varying from 95 ct. for most efficient growers to $1.80 for the least efficient third. Boxes and box making averaged 26 ct. per box, packing 37 ct., and storage 17 ct. Yield was the most important factor. Each increase of 50 boxes in yield between 20 and 499 packed boxes per acre decreased cost of growing and harvesting 20 ct. per box. From 1939–40 to 1944 costs of growing and harvesting increased 158 percent and labor costs 188 percent.

Farm production, farm disposition, and value of barley, 1909–41, by States, H. R. WALKER ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1944, pp. 39+, illus. 1*).—Tables show by States the production, farm disposition, seasonal average prices, and value by years.

Farm production, farm disposition, and value of buckwheat, 1909–41, by States, A. P. KELLY and J. H. PETERS (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg.*

Bd., 1944, pp. 27+, illus. 1).—Tables for the United States and States show by years the production; the amounts used for seed, fed to livestock, ground for food, and sold; average price received; and value of the crop.

Farm labor management, E. F. Rebman (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 116–127, illus. 3).*—In 21 Michigan counties, 103 farmers normally employing at least one hired man were contacted in the spring of 1944. The length of time the same hired man stayed, cash wages and bonuses paid, perquisites furnished, hours worked, vacations, age and ability of the hired men, personal relations between hired men and employers, profit sharing with hired men, and suggestions of the farmers as to means of keeping help are discussed.

The average length of employment was 3.2 yr. for single and 2.6 yr. for married men. Average wages per month were $69 plus board, room, and laundry valued at $40 for single men, and $98 cash plus perquisites valued at $33 for married men. Time worked per day during the summer averaged 11 hr. About 45 percent of the hired men expected vacations. The average age of hired men was 26 yr. for single and 33 yr. for married men. Sixteen percent of the farmers shared profits with their married help and almost 45 percent were to receive a bonus. Higher wages, bonuses, shorter hours, vacations, age, and ability of hired men and profit sharing increased length of service on the same farm.

The production credit system for farmers, E. L. Butz (*Washington, D. C.: Brookings Inst., 1944, pp. 104+, illus. 3).*—The agricultural financing of the system is described, the current financial position and operating efficiency discussed, the amount and the effect of Federal subsidy analyzed, and a broad policy and course of future action suggested.

Farm bookkeeping and the Federal income tax (*U. S. Dept. Agr., Misc. Pub. 554 (1944), pp. 16).*—This statement, prepared by the Bureau of Agricultural Economics and the Extension Service "to help farmers understand some of the problems involved in making adequate summaries of the farm business for Federal income-tax returns," discusses records for tax purposes, accounting methods and procedures, farm income and expenses on cash and accrual bases, net farm profit, nonfarm receipts and expenditures, kinds of reports, and determining the amount of tax. A check list for farm expenses is included. The circular does not deal with setting up a system of accounts nor give a complete set of instructions for filling out an income tax blank.

Revised annual estimates of interest charges and interest rates on farm-mortgage debt, 1930–43, H. D. Umstott and S. L. Yarnall (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 34+, illus. 8).*—Tables, charts, and maps show by geographic divisions and the United States the average interest rates, reductions granted on Federal agency loans, relations of interest charges and cash farm income, rates charged by various lender groups, and by tenure under which the land is operated.

County fiscal procedures in New York, C. A. Bratton (*[New York] Cornell Sta. Bul. 805 (1944), pp. 32, illus. 1).*—The major fiscal procedures in New York—assessment of real property; equalization of assessments; apportionment, levy, and extension of taxes; collection; budgetary procedures; purchasing; auditing; payment of claims; fiscal records, accounts, and reports; borrowing; workmen's compensation; the employees' retirement system; and official bonds or undertakings—are described. The problems are analyzed, the legal bases for the procedures, and the actual practices discussed and recommendations made.

Tax collection and tax delinquency: Fifteen rural New York counties, C. A. Bratton (*[New York] Cornell Sta. Bul. 806 (1944), pp. 35, illus. 4).*—The counties studied were rural counties with less than 175,000 population. The detailed data on tax levies were for 1935–39. The tax sale data were for taxes levied in 1936. The tax collection procedures, the trends in levies and collections, the sales for taxes and subsequent action, the county-held tax-delinquent properties, and the collection of delinquent school taxes are described and discussed.

In the 15 counties the percentage of taxes levied returned unpaid by collectors increased from 3.3 percent in 1920 to 15.6 percent in 1939. Liens representing 3 percent of the levies in 1939 were sold at tax sales, and about 2 percent were relevied, reassessed, or cancelled. Lands and buildings made up the largest number of properties sold in 1936, and houses and lots the second largest number. Properties with taxes of over $100 per parcel made up the largest proportion of the amount sold, but about one-third of the parcels sold had taxes less than $5, and nearly two-thirds, less than $25. The counties bid in 78.8 percent of the parcels. Approximately 60 percent of the parcels sold, representing about 80 percent of the total amount of taxes on properties sold, were redeemed. Most of the parcels sold and most of those bid in by the counties were in the lower land classes. Some of the counties had active programs for the disposal of the lands bid in.

Trucking livestock in Corn Belt region, D. H. Stark. (Coop. U. S. D. A. and 13 expt. stas.). (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 96–106*).—A summary and digest of Missouri Station Bulletin 479 (E. S. R., 92, p. 130).

Efficiency of milk marketing in Connecticut.—VIII, Possible milk delivery economies in secondary markets, S. K. Seaver and R. G. Bressler, Jr. ([*Connecticut*] *Storrs Sta. Bul. 252 (1944), pp. 68, illus. 16*).—This eighth bulletin of the series (E. S. R., 90, p. 404) discusses the secondary milk markets of the State, the theory of effective distribution, and the methods used in the study. Detailed analysis of the general characteristics of the markets, duplication of delivery routes, present organization of routes, and potential effects of exclusive delivery territories on costs of delivery and possible savings for Torrington and Willimantic, and less detailed analysis of the markets in the suburbs of New Haven are made. Custom pasteurization, semiexclusive areas, pooled loads, and the public utility status of the milk industry, etc., are discussed. An annotated selected bibliography on milk distribution efficiency is included. Brief statements on the details of delivery in Connecticut secondary markets in 1940 and the effects of location, volume, and delivery density on mileage reductions in exclusive territories are included in the appendixes.

Some of the findings and conclusions based on the series of publications follow: Immediately preceding the war daily deliveries to homes required approximately 630 ft. of truck travel per quart of milk. With alternate-day deliveries this was reduced to 380 ft. Market zoning and exclusive delivery territories would make possible reduction to about 150 ft. with daily deliveries, 100 ft. with alternate-day deliveries, and about 55 ft. with a complete consolidation into a public utility or publicly operated monopoly. For the 36 secondary markets, daily deliveries under the present system involve annually over 9,000,000 miles of truck travel, 1,300,000 gal. of gasoline, 50,000 qt. of oil, and 2,500 truck tires. With alternate-day deliveries the mileage would be reduced about 4,000,000 miles, and with alternate-day deliveries and exclusive territories a further reduction of approximately 4,000,000 miles would be possible. The reductions in gasoline, oil, and tires would be approximately in the same proportions. The number of routes and regular drivers with daily deliveries was about 700 and with the present alternate-day deliveries, about 600. It is estimated that with complete monopoly and alternate-day deliveries they could be reduced to 350, and the costs per quart of milk reduced to 1 ct. for plant operations, 0.5 ct. for administration, 0.3 ct. for truck expenses, 0.4 ct. for miscellaneous route expenses, and 1.3 to 2.6 ct. for route labor.

Seasonal price movements of fire-cured tobacco in Kentucky, C. M. Clark, W. C. Binkley, and D. M. Pettus (*Kentucky Sta. Bul. 460 (1944), pp. 32, illus. 14*).—The phases and effects of supply estimates, quality, demand, and competition in buying on seasonal trends and of sales volume, sales, sudden changes in quality, and purchases on order on weekly fluctuations are discussed. Charts present data for different areas and by types of tobacco.

Normally the seasonal trend is level, or horizontal, until the closing weeks of the season when there is a distinct movement downward. In individual years there is considerable fluctuation from the normal trend at the opening, least in the middle, and greatest at the close of the season. The loan program of cooperative marketing associations, while partially effective, does not check the decline of general price level entirely due to relatively heavier sales of low-quality tobacco and the increased resales by dealers in the closing weeks of the season. Relatively wide and frequently irregular variations from week to week are an important characteristic of the seasonal pattern of prices.

Changes in seasonal variation of the wholesale price of eggs in New York City, A. VAN WAGENEN (*[New York] Cornell Sta. Bul. 808 (1944), pp. 36, illus. 6*).—Tables and charts are included and discussed showing the seasonal variations, 1910–43, in the price of best large white, smaller size white, brown and mixed color, Pacific Coast white, and refrigerator hen eggs, and of duck and goose eggs. The dependence of farm prices on city prices and the sources and history of egg market quotations are described.

The seasonal variations result chiefly from the changes in supply and are similar for all grades and classes of eggs. It has reached about 50 percent as high now as in 1915 and the peak price is reached about a month earlier in the year. Since 1935 summer prices have exceeded winter prices. Seasonal variation in farm prices is now greater than in city prices, and the peak price is reached about a month earlier. During the period 1937–41 the price of medium-sized white eggs was about 83 percent, pullet-sized 60 percent, and peewee-sized eggs 50 percent of the price of large white eggs. Brown eggs were 97–98 percent of the quotation for white eggs during the summer and fall and about 88 percent during the winter and spring, and mixed color eggs varied from 77 percent in the fall to 85 percent during the winter and spring. There has been a decided trend toward a wider spread between the prices of the best quoted classification and specials, the second quality classification for white eggs. The spread for all lower grades tended to widen during the late summer and early fall and to become less during the winter and early spring. Refrigerator egg prices show small variation during the relatively short period when they are on the market, but tend toward lower prices as the season progresses. White eggs from storage averaged about 72 percent of fresh egg prices during the fall for the period 1937–41.

Producers' prices for eggs in Knoxville trade area, B. H. LUEBKE and M. M. GUILFORD (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 175 (1944), pp. 36+, illus. 25*).—Market balance as a factor in prices; long-time trends, cyclical, random, and seasonal fluctuations, and regional differences in egg prices; the effects of local seasonal receipts and cold storage movements on Knoxville prices; and the differential between Knoxville and New York prices are discussed.

Production, demand, and price trends for dairy products in the United States and Washington previous to 1944, H. A. BENDIXEN and E. F. DUNMEIER (*Washington Sta. Bul. 442 (1944), pp. 74, illus. 8*).—The supplies, consumption, and prices of dairy products are analyzed and discussed, the principal emphasis being placed on the effects of the war. Alternate opportunities for profitable employment are discussed briefly. Some of the findings and conclusions were:

For the United States production and total consumption changed little from 1932 to 1938, but per capita consumption decreased due to the increase of population. Production, both total and per capita, and total consumption reached their highest point in 1942. In 1943 due to decline of production and large diversion to military and lend-lease purposes, the per capita consumption of dairy products other than fluid milk declined markedly. The recent tendency has been to consume the greater portion of the products in forms including the nonfats as well as the fats. Total consumption is greatest in the larger income families. Higher income resulting from "war prosperity" has greatly increased the demand for all dairy products.

Washington has about the same number of cows per capita as the United States, but its production of milk and butterfat per cow and the total production of dairy products per capita are about one-third higher. From 1930 to 1942 production of butterfat increased 30 percent in Washington as compared with 20 percent in the United States. The percentage of increase in Washington was greater in production of cheese, evaporated milk, and ice cream, and in the United States for butter and nonfat dry milk solids. The average prices for dairy products and for all farm products declined about 60 percent from the period 1910 to 1914 to the depression years as represented by 1932. From 1938 to 1942 prices of dairy products relative to those for other farm products were sufficiently higher to lead to increased per capita production. In 1943 prices for dairy products were the most unfavorable of all farm product prices. Under Government control, prices compared with 1928 were permitted to advance 4 percent for sour cream in Washington, 15 percent for dairy products in the United States, 43 percent for all farm products in Washington, and 75 percent for hourly earnings of factory workers.

Dairy and poultry market statistics, 1943 (*U. S. Dept. Agr., War Food Admin., Off. Distrib., 1944, CS–9, pp. 40+*).—Statistics are included of monthly average prices, receipts at terminal markets, storage holdings, and sales of butter and cheese; weekly prices, receipts, and deliveries in the Boston, New York, and Philadelphia areas, and storage holdings of milk and cream; prices of evaporated and dry skim milk and casein; weekly Chicago feed-egg ratios, monthly average prices, receipts at Eastern egg auctions and assembling plants, Central West packing plants, and terminal markets, sales, shipments, and storage holdings—shell and frozen eggs; receipts at Central West packing plants and terminal markets and average prices at Boston, Philadelphia, and San Francisco—of live poultry; receipts and storage holdings of dressed poultry; and the purchases of dairy, egg, and poultry products by the Federal Surplus Commodity Corporation.

Assessors' enumeration of 1942 crops, R. E. STRASZHEIM and M. M. JUSTIN. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock, No. 220 (1944), pp. 12*).—A table shows by counties the number of farms and total acreage, acreages of different crops harvested, and land use. A table of farm prices, indexes, and ratios covering different years and periods is also included.

Annual crop summary, 1943, R. E. STRASZHEIM and M. M. JUSTIN. (Coop. U. S. D. A.). (*Indiana Sta., Ind. Crops and Livestock, No. 219 (1943), pp. 24*).—A continuation of the series (E. S. R., 90, p. 119).

RURAL SOCIOLOGY

Constructing rural sociology, L. NELSON. (Univ. Minn.). (*Rural Sociol., 9 (1944), No. 3, pp. 219–225, Span. abs., p. 219*).—The author concludes that the rise of interest in rural social problems after 1900 was due in large measure to the maladjustments in rural life growing out of the rapidity of settlement on the scattered farmstead pattern, the heterogeneous ethnic composition of the population, the wasteful exploitation of natural resources, and the rise of the "conservation movement" of which the emphasis on human resources may be considered a phase. The rural life "evangelists" paved the way for the teachers, textbook writers, and the scientific approach to the study of rural life.

Further validation of the Wert-Myster Farming Attitude scale, A. M. MYSTER (*Rural Sociol., 9 (1944), No. 3, pp. 226–232; Span. abs. p. 226*).—"This paper presents some evidence relative to the validity of the Wert-Myster Farming Attitude scale for a group of young women majoring in home economics at Virginia State College. The whole scale is divided into two subscales, one measuring attitude toward farming as a vocation and the other attitude toward farming as a way of life. Reliability has been determined by the split-halves method, and validity has been inferred from the fact that the scale differentiates between persons of known different farming attitude. Evidence is presented that the whole scale, the vocational items, and the life items are of satisfactory validity and reliability. Finally it is shown that attitude toward farming as a vocation and attitude toward farming as a way of life are related, but it is indefensible to interpret the two as strictly identical behaviors."

Rural population (*Rhode Island Sta. Rpt. [1943], pp. 37–38*).—In a study of the foreign-born in Rhode Island to determine differential tendencies it was found that the Russians and the Scotch were least disposed to rural settlement, whereas the Portuguese, Canadians, and Poles were most disposed.

In a study of 200 households in eight northern Rhode Island towns a pattern of living was found similar to that typical of homes located near most New England cities. Households approached in size those usually found in cities; occupationally 87 percent received all of their income from nonagricultural sources. A few looked to the land as a lucrative source of income at present or in the future, but the land was not put to any great remunerative use. The great majority gave as their reason for relocating the desire to live in the country and to enjoy certain intangible values and expectations.

Labor and tenancy changes on Arkansas farms (*Arkansas Sta. Bul. 443 (1944), pp. 5–6*).—The number of share-cropper families on plantations in Chicot, Pulaski, and Mississippi Counties declined throughout the period 1932–40, and by 1940 the rate of reduction in Chicot County was 42 percent, in Mississippi County 30 percent, and in Pulaski County 19 percent. The reduction in share-renter and share-cropper families until 1940 was made up, in part, by an increase in the number of regular wage laborers, especially in Chicot and Mississippi Counties. In Pulaski County resident labor on farms is fast disappearing. The reductions in the labor supply on cotton farms in the counties mentioned in the early part of the 12-yr. period, beginning in 1932, is traceable in large part to reduction in cotton acreage, in part to the expanding use of farm machinery, and since 1941 to the heavy drain on man power for the armed services and defense production.

Despite low land values and the ease with which farms may be acquired in the Arkansas Ozarks, tenancy has increased as a long-time trend. Migration data for the children of present owner operators show that the process of alienation from the land may be expected to continue. Of 25 owner operators over 60 yr. of age, only 8 had a son remaining on the farm who would presumably continue the farm as the owner after the death of the parent. The migration of sons is due to a responsiveness to outside economic opportunity rather than to "pressure" of population on the land.

Limited numbers of men at work chosen when boys (*Pennsylvania Sta. Bul. 464 (1944), p. 23*).—Ten yr. after leaving high school only 18 percent of the boys in a study of out-of-school rural youth were found to be following the line of work of their first occupational choice. An additional 23 percent had found employment in their first choice but had left their occupation. Forty-four percent were engaged in the occupation in which they found their first employment after leaving high school. Thirty-five percent had changed their occupation one or more times. Thirty-nine percent accepted their first employment in the same occupation as their fathers, although only 13 percent had indicated their fathers' occupation as a first choice. Thirty-seven percent of the young men had migrated from the communities in which they had been reared.

Modern homes are fewer on farms than in villages (*Pennsylvania Sta. Bul. 464 (1944), p. 23*).—Rural farm people in Pennsylvania are more poorly housed than either rural nonfarm or urban people. A survey of 517 rural homes in 10 selected areas of the State revealed that almost one-fifth of these homes were crowded. One-third were in need of structural repairs, and nearly two-fifths were poorly located. Two out of 5 houses were without running water, and more than half lacked fully equipped bathrooms. Houses which were occupied by tenants or by large families tended to be inferior. Rural housing conditions of farmers and nonfarmers improved with income.

Rural levels of living in Michigan, C. R. HOFFER (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 1–7*).—The index of the level of living used in this study was derived from information reported in the Sixteenth Census, using the following items reported there on a county basis: Percentage of occupied dwelling units with fewer than 1.51 persons per room, percentage of dwelling units with radios, percentage of farms with gross income of more than $600, percentage of farms reporting automobiles of 1936 or later model, and median grade of school completed by persons 25 yr. of age and over.

Rural youth in low income agricultural areas, W. A. ANDERSON. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul. 809 (1944), pp. 41, illus. 7*).—The major implication of this study, carried on in three areas of New York State, is that when rural youth reared in families indigenous to areas of limited rural opportunities are studied relative to their geographic and occupational mobility it is found that they do not leave these areas or occupations offered in them in any large proportions as do the youth in areas of better agricultural opportunities. The result is the perpetuation of family type that makes the problems of educational, social, and economic betterment extremely difficult.

Farm Security Administration clients improve production and income (*Pennsylvania Sta. Bul. 464 (1944), pp. 23–24*).—Study of the results accomplished by 206 clients of the Farm Security Administration from 1939 to 1942 disclosed that comparatively few of the loans were being repaid as rapidly as originally contemplated. Nevertheless there was a gradual increase in household conveniences, in production, and in income.

Prestige classes in a New York rural community, H. F. KAUFMAN. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Mem. 260 (1944), pp. 46, illus. 1*).—Sections developed include rating of prestige, general social characteristics, informal and formal association, social attitudes and cleavages, and personality characteristics in a central New York township of about 1,500 people of whom two-fifths live in the village and the remainder in the open country.

The land and the rural church, T. S. BUIE. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 3, pp. 251–257; Span. abs., p. 251*).—This study shows how land misuse and soil erosion seriously affect the rural church. The 222 churches studied were classified into three groups according to soil conditions surrounding each church: Moderate erosion, moderate to severe erosion, and severe erosion. These groups include 47, 89, and 86 churches, with 132 and 105 in the areas where erosion was more and most severe. There was only slight difference in the average attendance reported by pastors, but in the average of total contributions to the churches there was $1,135 annually in the least eroded areas and $762 and $533 where erosion was progressively more severe. Pastors' salaries averaged $431 in the first group, $300 in the second, and $241 in the third.

Social participation and religious affiliation in rural areas, W. A. ANDERSON. (Cornell Univ.). (*Rural Sociol., 9 (1944), No. 3, pp. 242–250; Span. abs., p. 242*).—

Membership in a religious denomination is found to be associated with participation in other organizations, since individuals belonging to rural churches are active in other kinds of organizations in greater proportions than those who are not church members. When the factors of farm ownership and land classes are held constant, participation in the rural areas of New York seems greater among the Protestants than the Catholics, and denominationally the Congregationalists, Presbyterians, and Friends seem to be slightly more active than the Baptists and Methodists.

Rural churches and community integration, L. BULTENA. (Univ. Wis). (*Rural Sociol., 9 (1944), No. 3, pp. 257–264, illus. 3; Span. abs., p. 257*).—"A church survey in a rural area near Madison, Wis., reveals that the rural churches here are highly selective with regard to memberships. Their memberships cut across many boundaries of areas which may be considered communities according to other criteria. Members often travel far from home to go to the church of their choice. The rural church serves to integrate family, occupational, national, status groups, and the like, rather than community groups based on localities."

Facilitation of social action in the field of rural health and medical service, C. E. LIVELY. (Univ. Mo.). (*Rural Sociol., 9 (1944), No. 3, pp. 271–273*).—The author discusses the function of the rural sociologist in the field of public health and medical service. He cites Missouri literature on the subject and sketches recent developments in the State.

Changes in the characteristics and number of practicing physicians in rural Ohio 1923–1942, R. L. MCNAMARA. (Ohio Expt. Sta.). (*Rural Sociol., 9 (1944), No. 1, pp. 10–20; Span. abs., pp. 10–11*).—Important changes in the characteristics and number of physicians practicing in rural areas in Ohio include the urbanward trend resulting in large increases in the number of patients for the remaining rural physicians, the disproportionate number of aged among rural and urban practitioners, the scarcity of specialists in rural areas, and the high rates of turnover among rural physicians, with an undoubted effect on the stability of rural medical practice, even during pre-war years. The situation has been greatly aggravated by wartime demands for health services and by the departure of many young rural physicians to the armed services. The disparity before the war was not particularly disadvantageous when travel was unrestricted, but wartime travel limitations have brought the full effect of rural physician shortages home to rural people.

Farmer views on the medical situation, C. F. REUSS (*Washington Sta. V Cir. 20 (1944), pp. 4*).—Answering the question "What are the two major health problems in your neighborhood today?" 35 percent said the cost of services was too great for family income, 32 percent said the community doctor was overworked, 27 percent indicated a lack of hospital facilities, and 25 percent said no doctor was close at hand. Out of nearly 1,850 farmers, response from 59 percent favored a health cooperative while only 24 percent favored socialized medicine and 50 were opposed to it.

Small farmers of the Pacific Northwest organize neighborhood discussion groups, J. J. KING. (U. S. D. A.). (*Rural Sociol., 9 (1944), No. 1, pp. 38–44; Span. abs., p. 38*).—Neighborhood discussion groups are described as an effective method for stimulating small farmers to help themselves. The Farm Security Administration practice is to confine the organizational work of these groups mainly to those specific areas which contain a high concentration of small underemployed farmers and where there is an unfilled need for this sort of organization. Functioning groups may be found in several rural areas. Much of their energy during wartime goes into group action. The participants learn that individual well-being frequently comes from groups of people meeting together, thinking together, and acting together.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Distinguishing method differences by use of discriminant functions, W. D. BATEN and H. M. HATCHER (*Jour. Expt. Ed., 12 (1944), pp. 184–186; abs. in Michigan Sta. Quart. Bul., 27 (1944), No. 1, p. 153*).—A means of testing the effectiveness of teaching is described as used in classes in home economics.

Bibliography on extension research, L. CRILE (*U. S. Dept. Agr., Ext. Serv. Cir. 416 (1944), pp. 161+*).—"This bibliography contains references to 418 research studies pertaining to the organization, administration, and methods of doing extension work. Subject-matter studies are not included."

An interpretation of staff opinions on extension leadership, W. R. GORDON (*Rural Sociol., 9 (1944), No. 3, pp. 232–242; Span. abs., p. 233*).—This evaluation of leadership is based upon a canvass of opinions of almost 100 local voluntary leaders. The summary of the interviews illustrates how varied is the function of leadership from one division of extension work to another (agriculture, home economics, and 4-H Club work); from one subject-matter line to another (vegetable gardening to agricultural marketing); from one level of extension organization to another (neighborhood, community, county); from one county situation to another; and from one county worker to another. On the basis of these observations, the author has formulated a list of 15 recommendations which, taken together, appeal to him as a comprehensive program for leader development.

FOODS—HUMAN NUTRITION

United States consumption of food in terms of fats, proteins, carbohydrates, and calories, 1939–43, O. B. RYDER ET AL. (*Washington: U. S. Tariff Comn., 1944, pp. 123+, illus. 3*).—This report gives comprehensive data for each year 1939–42, expressing United States production, imports, exports, and human consumption of each foodstuff in pounds of fat, protein, and carbohydrate, and in numbers of calories. In appendix A an estimate is given for 1943 of the human consumption of each foodstuff in pounds of these nutrients.

Relative nutritive-unit cost values of some fruits and vegetables, R. E. MARSHALL (*Michigan Sta. Quart. Bul., 27 (1944), No. 1, pp. 128–138*).—A selected list of horticultural products was chosen for evaluation as to the relative nutritive value, expressed by an arbitrary numerical rating system, of each of the 20 fruits and 20 vegetables for each of the nutrients considered. An over-all rating of the relative nutritive values of these groups was derived by summing up the ratings of each product for the several nutritive groups (protein, carbohydrates, fat, calories, Ca, P, Fe, vitamin A, thiamine, ascorbic acid, and riboflavin). The nutritive economy of each product was estimated as the cost (based on Detroit and Cincinnati retail prices for 1942) per nutritive unit of the usable portion. Certain applications of the rating charts are indicated.

The comparative nutritive values of vegetables, A. F. MORGAN. (Univ. Calif.) (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 11, pp. 334–337*).—Noted elsewhere in greater detail (E. S. R., 90, p. 706).

Eating quality and some aspects of composition of turnip greens at successive stages of growth, J. WHITACRE, G. S. FRAPS, S. H. YARNELL, and A. G. OBERG. (Tex. Expt. Sta.). (*Food Res., 9 (1944), No. 1, pp. 42–55*).—Proximate and mineral (Ca, P, Fe) constituents were determined in Seven Top turnip greens grown in two fall seasons at College Station, Tex., and harvested over 5- and 8.5-week periods, respectively. All samples subjected to chemical analysis were guarded against contamination from dust and metal utensils. The greens were washed, rinsed with distilled water, dried of superficial moisture, and weighed for the "fresh weight" bases. The greens were then allowed to wilt and were dried at 100° C. in an electric oven with forced draft, ground in a ball mill, and sifted through a 30-mesh silk bolting cloth. Determinations were made on the dried material by A. O. A. C. methods, except that iron was determined by an *o*-phenanthroline method on samples wet-ashed with nitric, sulfuric, and perchloric acids. The data are reported in detail on moisture-free and fresh bases for individual samples harvested at intervals from the time the turnip greens were pulled in thinning until they were well past market maturity. On the moisture-free basis the protein, ash, calcium, and iron tended to decrease with increased growth, while nitrogen-free extract and fiber increased. Phosphorus varied irregularly. On the fresh basis there was a progressive decrease in moisture content with increasing maturity and an increase in all other constituents. Water averaged 91.3 percent and the maximum change with age was slightly under 5 percent. Considering all samples on the fresh basis, the ranges in percentage content of the constituents were as follows: Protein 2.43–4.47, fat 0.19–0.48, nitrogen-free extract 1.54–4.90, fiber 0.56–1.11, total ash 1.18–1.55, calcium 0.12–0.26, phosphorus 0.032–0.088, and iron 0.0012–0.0024.

Tests for tenderness made on six successive samples of greens from one crop with the Warner-Bratzler shearing device showed that toughness of raw stems, leaf blades, and stems with leaf lobes increased with age as shown by mechanical shearing tests, but at each stage the toughness of these three parts of the greens leaf was similar. Cooking tendered all three parts of the greens in approximately the same time. As judged in laboratory tests and in actual household practice by cooperating families, eating quality of the greens was found not to be related to stage of growth. In laboratory tests, the cooking of ¾ lb. of greens with 3 or 6 cups water until "done" by the fork test resulted in a cooked product of higher tenderness and flavor score than the product obtained by cooking the greens with ½ or 1 cup of water. It is suggested, therefore, that 4 cups of water to 1 lb. of raw greens be used for cooking to insure a palatable product permitting consumption of the cooking liquor. The cooking tests suggested that 100 gm. of raw washed greens would make a serving when cooked.

Smoking and cooking lake herring, suckers, [and] carp (*Michigan Sta. Folder 3 (1944), pp. [8]*).—Directions, by P. I. Tack, for cleaning, curing, and smoking fish; and recipes, by H. A. Baeder, for preparing smoked fish dishes are presented.

The retention of the nutritive quality of beef and pork muscle proteins during dehydration, canning, roasting, and frying, C. E. Poling, H. W. Schultz, and H. E. Robinson (*Jour. Nutr., 27 (1944), No. 1, pp. 23–34*).—The protein quality of the processed meats was evaluated by the growth response of young rats fed over a period of 8 or 10 weeks a diet containing the meat proteins at 17–20 or 8–11 percent levels and furnishing, respectively, 10–15 and 7–9 percent of the total calories. The results of the feeding tests suggested (1) that the nutritive quality of the canned cured pork shoulder may have been slightly lowered, in comparison with the raw cured pork shoulder, by the commercial canning process; and (2) that the proteins of dehydrated pork muscle and fried fresh pork shoulder were slightly superior in nutritive quality to those of canned cured pork shoulder, roast fresh pork shoulder, and dehydrated beef muscle.

The pyridoxine content of fresh, pasteurized, evaporated, and dried milk, A. Z. Hodson (*Jour. Nutr., 27 (1944), No. 5, pp. 415–418*).—Pyridoxine was determined by the method of Stokes et al. (E. S. R., 91, p. 127) in representative, but not paired, samples of fresh and processed milks. The pyridoxide content, in milligrams per liter of fresh or reconstituted milk, averaged 0.67 (range 0.48–0.95) in the 10 pooled samples of fresh milk from several farms; 0.65 (0.47–0.90) in the 10 samples of pasteurized milk from two plants; 0.73 (0.51–1.05) in the 22 samples of evaporated milk from several plants of wide geographic distribution; 0.66 (0.31–1.14) in the 10 samples of dry skim milk from four plants; and 0.65 (0.40–1.12) in six samples of dry whole milk from a single plant. The unweighted average of the 58 samples was 0.67 mg. per liter. These results indicated that there were no significant losses of pyridoxine in the preparation of the pasteurized, evaporated, or dried milk assayed. On the undiluted basis the evaporated milks averaged 1.46 mg. pyridoxine per liter and the dry skim and dry whole milks 6.8 and 5.0 mg. per kilogram, respectively.

Milk preferences of school children, D. DICKINS (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 10, pp. 1, 7*).—Groups of 291 white and 392 Negro high school children in Mississippi were asked to select the 3 most popular foods from several combinations of 20 common foods—sweet milk, buttermilk, butter, cheese, chicken, eggs, fish, salt pork, steak, gravy, sirup, butter beans, string beans, cabbage, collards, field peas, turnip greens, tomatoes, corn bread, and biscuit.

Sweet milk ranked fourth in popularity with white boys, eighth with white girls, sixth with Negro boys, and tenth with Negro girls, while buttermilk ranked sixteenth, fourteenth, fifth, and seventh for the different groups in the same order. The lists of foods in which sweet milk and buttermilk appeared were (1) corn bread, buttermilk, boiled cabbage, turnip greens, fried fish, biscuit; (2) corn bread, cheese, fried chicken, steak, sweet milk, biscuit; and (3) biscuit, buttermilk, sweet milk, tomatoes, butter beans, corn bread. One of the most popular combinations selected by the white children was corn bread, sweet milk, and butter beans; and the most popular combination selected by the Negro children was corn bread, buttermilk, and butter beans. When sweet milk was the only form of milk on the list it was taken by 81 percent of the white and 68 percent of the Negro children, but when buttermilk was the only form it was selected by 60 percent of the white and 74 percent of the Negro children.

The bread problem in war and in peace, S. LEPKOVSKY. (Univ. Calif.). (*Physiol. Rev., 24* (*1944*), *No. 2, pp. 239–276*).—This review deals with the relative nutritional merits of whole wheat, long extraction, and enriched white flours and breads, and is based on 138 studies cited from the literature.

The protein nutritional value of soybean, peanut, and cottonseed flours and their value as supplements to wheat flour, D. B. JONES and J. P. DIVINE. (U. S. D. A.). (*Jour. Nutr., 28* (*1944*), *No. 1, pp. 41–49*).—Soybean, peanut, and cottonseed flours, specially prepared for human consumption and made by the expeller process, were used in this study. Their protein qualities, in comparison with those of casein and skim milk powder (both of high protein quality) and of whole-wheat flour and patent wheat flour were evaluated by the growth response of rats fed these foods at 9 or 15 percent protein levels in diets otherwise adequate. The ability of the proteins of soybean, peanut, and cottonseed flours to supplement those of wheat flour was also studied. The growth rates observed indicated that the soybean, peanut, and cottonseed flours contained proteins of high nutritive value, and suggested that these flours would offer an excellent means of supplying dietary protein to extend and partially replace protein foods of animal origin. These plant proteins were well adapted to enhance the nutritive value of the proteins of wheat flour. As little as 5 parts of peanut, soybean, or cottonseed flour with 95 parts of wheat flour produced mixtures containing 16–19 percent more protein than wheat flour alone and a protein combination that was definitely superior in its growth-promoting value to the same quantity of protein from wheat flour.

Analysis of barley from King Tutankhamen's tomb, E. C. BARTON-WRIGHT, R. C. BOOTH, and W. J. S. PRINGLE (*Nature* [*London*], *153* (*1944*), *No. 3879, p. 288*).—Authentic samples, carbonized but essentially intact in structure, were found to contain no vitamin B_1, but riboflavin and nicotinic acid amounted, respectively, to 0.85 μg. and 28 μg. per gram. Corresponding values for fresh barley average 2.5 and 90 μg. per gram. Total and phytate phosphorus values were found to be, respectively, 414 and 0.4 mg. per 100 gm. Corresponding values for fresh barley are 370 and 249 mg. per 100 gm. These results indicate that the phytic acid originally present in the grain had been almost completely hydrolyzed.

Ten rules for use of soya, M. E. KIRKPATRICK. (U. S. D. A.). (*Jour. Home Econ., 36 (1944), No. 5, p. 286*).—This is a brief presentation of practices developed in experimental work with soya flour and grits to assure satisfactory quality of the cooked products.

New methods of canning asparagus, W. V. CRUESS. (Univ. Calif.). (*Canner, 98 (1944), No. 24, pp. 12–13*).—Packs of asparagus in the juice extracted from the portions of stalks discarded in trimming were firmer and richer in flavor than asparagus from the same lot subjected to the usual brine pack; moreover, the stalks canned in juice contained 36 mg. ascorbic acid per 100 gm. as compared with 20 mg. for those canned in brine. To permit ready extraction and prevent darkening, the stalks were steamed 5 min. and then pressed promptly, the juice obtained being filtered hot with the addition of about 1 percent of some filter aid.

Acidification of the juice or the regular brine with not less than 0.6 percent citric acid gave pleasing packs with a distinctly tart taste.

Grade labeling of canned foods, M. REID (*Jour. Home Econ., 36 (1944), No. 1, pp. 9–12*).—"This article presents the high lights of the situation, examines the present status of voluntary grade labeling, and offers some suggestions for action by those interested in adding to labels further information useful to consumers."

Grade-labeling catechism, P. GADE. (*Jour. Home Econ., 36 (1944), No. 5, pp. 277–280*).—This paper gives the answers to selected questions frequently asked concerning the grade labeling of food.

The A-B-C of grade labeling, P. GADE (*Food Packer, 25 (1944), No. 6, pp. 45, 52.*)—Essentially noted above.

Comparative study of steam and hot water blanching, D. MELNICK, M. HOCHBERG and B. L. OSER (*Food Res., 9 (1944), No. 2, pp. 148–153*).—This study, conducted with regard to home-canning conditions, compared the influence of hot water blanching (100° C.) and steam blanching (100°) of green snap beans upon the enzymes, indophenol oxidase, peroxidase, catalase, and ascorbic acid oxidase. Hot-water blanching of the beans was found to be more effective than steam blanching for inactivating these natural enzymes, complete inactivation being effected in 3 and 5 min. by the respective procedures. The hot-water blanching, however, extracted more of the soluble nutrients, as typified by ascorbic acid, than did the steam blanching which resulted in insignificant losses. Since the difference between these blanching procedures was not appreciable with respect to time, the steam blanching method was preferred.

Some effects of blanching, A. S. CRAFTS. (Univ. Calif.). (*Food Indus., 16 (1944), No. 3, pp. 76–77, illus. 4*).—Photomicrographs of pear tissue show that displacement of intercellular air is effected by blanching. This is a most important change, since entrapped air (1) contributes to a dirty-white, opaque appearance, (2) acts as an insulator, restricting inward movement of heat and outward diffusion of water, thereby prolonging the dehydration period, and (3) reduces ascorbic acid content and keeping quality of the dehydrated product. Complete displacement of intercellular air during blanching and dehydration brings about marked improvement in the texture of the cooked product. It is pointed out that the ideas that blanching "breaks down the cells" and that sun-drying "fixes the color" in dried products are erroneous.

Effect of freezing on utilization of canned foods, H. R. and K. R. SMITH (*Food Res., 9 (1944), No. 1, pp. 66–75*).—To determine the changes that may occur in canned goods due to exposure to severe winter temperatures, 35 canned products packed in tin containers were examined after being once and twice frozen for 7 days at —18° C. The cans were of normal commercial fill and included vegetables, fruits, fish, potted meat, meat stews and hash, milk, and soups. Observations, in comparison with normal unfrozen cans, were made with respect to appearance of cans, possible loss of vacuum indicating leakage due to freezing, changes in drained weight, change in appearance after slow and after quick thawing and after thawing and cooking, change in cooking properties, and change in the inside or outside of the container. Observations made in the examination of normal and frozen cans are recorded in detail. They indicate that frozen canned goods should be allowed to thaw gradually, preferably at room temperature overnight, and used in the usual manner. Canned foods containing cooked starch, as in corned beef hash, cream-style corn, and concentrated soups, showed the greatest difference in texture due to freezing, but this entirely disappeared on heating the contents for serving. A few of the canned products, notably asparagus, and to a lesser extent, tomatoes and wax beans, showed some softening of the tissues, resulting in lowered amounts of drained solids and a less attractive product upon heating; flavor, however, was not impaired. The ends of most solidly frozen cans were slightly bulged, due to expansion of the contents, but this bulge disappeared when the contents were thawed.

Foods which have been frozen (*Quick Frozen Foods, 6 (1944), No. 11, p. 29*).—This list of foods that have been frozen, either commercially or experimentally, includes approximately 350 items.

Speed is the keynote to quality, I, II, H. H. PLAGGE. (Iowa Expt. Sta.). (*Quick Frozen Foods, 6 (1944), Nos. 10, pp. 56, 70, illus. 3; 11, pp. 52, 62, illus. 2*).—Quality in frozen vegetables can be attained by (1) selection of a satisfactory product from the standpoint of varietal adaptability to freezing and prime maturity, (2) prompt handling of the product, (3) proper scalding of vegetables and some fruits before freezing, and (4) attention to packing requirements. In addition to these points, which are discussed, rapid freezing and storage at 0° F. or below are essential steps in the freezing preservation of vegetables and fruits.

Velva fruit (*Food Packer, 25 (1944), Nos. 5, pp. 30–31, illus. 1; 6, pp. 60, 62, 64, illus, 3*).—"Velva Fruit," the new frozen fruit dessert developed by the U. S. D. A. Western Regional Research Laboratory, Albany, Calif., is described, and formulas for its preparation are presented. The product, not yet produced commercially, is composed of fruit puree (fresh or frozen), sugar, gelatin (as a stabilizer), and, when desirable, citric acid. The mixture is frozen, smooth texture being obtained by the action of the ice cream freezer which incorporates air into the mix with a resultant "overrun," or volume increase, of about 100 percent. Sweetening agents and stabilizers are discussed.

A technique for testing consumer preferences, with special reference to the constituents of ice cream, C. I. BLISS, E. O. ANDERSON, and R. E. MARLAND (*[Connecticut] Storrs Sta. Bul. 251 (1943), pp. 20*).—"Consumer preferences for two qualitative factors in ice cream, vanilla and chocolate flavoring, and for two quantitative factors, percentage concentration of serum solids and of fat, have been tested on college students. The subjects ranked the four alternative ice creams of each series in order of choice. These ranks were then converted to scores suitable for use in the analysis of variance, with which the significant consumer preferences were identified. American process chocolate was preferred to three Dutch types, which were not scored equally. Natural vanilla flavoring rated higher than the artificial product but a 50—50 mixture of the two scored highest of all. In ice cream containing 14 percent fat, the preferred concentration of serum solids was 10.17 ± 0.37 percent; in that containing 11 percent of serum solids, the preferred concentration of fat was 13.49 ± 0.23 percent. Both sexes concur in these results.

"The design and statistical analysis of choice tests are given in detail. Simple methods are described for computing the concentration giving the maximum score and its error and for testing the homogeneity of the response to different items in a series. Possible applications of the techniques are indicated."

Varietal adaptability of strawberries to preservation in sulphur dioxide-calcium solution, C. W. Culpepper and J. S. Caldwell. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1943), Nos. 1, pp. 5–9, 25, 27, 29; 2, pp. 46–51*).—The 12 varieties of strawberries used in these tests were those making up about 70 percent of the commercial acreage of the United States. The berries, grown in commercial plantings near Salisbury, Md., were harvested and separately handled at early-ripe and medium-ripe stages. Tests were made on all lots of fruit to determine specific gravity, resistance to crushing pressure, and degree of disintegration on boiling in water for a specified time. Part of each lot was made into jam at the time of harvest, to serve for subsequent comparison with similarly prepared jam made from berries preserved for 8.5 mo. in SO_2–$CaCO_3$ solutions containing from 1,500 to 3,000 p. p. m. SO_2, and $CaCO_3$ in varying amounts. The fruit was preserved in 5-gal. containers and held at 70° F.

The jams were graded for consistency (as determined by penetrometer readings), retention of shape and wholeness of berries, flavor, and, in the fresh-fruit jams, for color. In the fresh-fruit jams, those made from Fairfax, Redstar, and Maytime varieties scored best; those from Aroma and Klondike, very good; those from Blakemore, Dorsett, Premier (Howard 17) and Lupton, fair; and those from Catskill, Dresden, and Pathfinder varieties, poor. The group termed poor was very unpromising, since the early-ripe berries yielded a jam very deficient in flavor, and the medium-ripe berries disintegrated very badly in cooking. Jams made from the SO_2 preserved berries fell into the same four groups, with the varietal rankings the same, except that Klondike fell into the fair group, while Blakemore became very good and Lupton dropped down to the poor group. In the material preserved with SO_2, color disappeared but returned in varying degrees as the SO_2 was driven off in cooking. The fruit preserved with SO_2 and $CaCO_3$, but not with SO_2 alone, retained shape and wholeness almost perfectly during the boiling into jam. The chief objection to the SO_2 method of preserving the strawberries was that it injuriously affected flavor, not so much because of retention of SO_2 as because of the loss of volatile constituents in the boiling down process, and difficulty in reducing the SO_2 content to the level permitted by British food regulations. Retention of wholeness and form of berries in the jams was definitely correlated with resistance of the raw fruit to crushing and imperfectly correlated with degree of disintegration on boiling in water, but was not correlated with specific gravity of the raw berries.

Preservation of pineapple with sulfur dioxide, W. C. Scott and D. J. Pentzer. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 7, pp. 206, 213, 217*).—Tests carried out with fruit of the 1943 Mexican pineapple harvest showed that 0.2 percent sodium bisulfite (0.1 percent SO_2) successfully preserved the color and flavor of sweetened and unsweetened pineapple for 8 weeks at 110° F. or for 3 mo. at room temperature. Sodium benzoate (0.1 percent), however, did not prevent darkening or fermentation. The SO_2 was readily removed from the crushed fruit by boiling, and removal was as complete when the boiling was carried out in the course of making preserves as it was in a preboiling operation; 20 min. of vigorous boiling was sufficient to reduce the SO_2 below the point where it is readily detected by taste. Samples of crushed pineapple stored for 8 weeks at 110° after treatment with 9 percent potassium metabisulfite darkened considerably, and when made into preserves decreased in fresh fruit flavor and increased in cooked fruit flavor. These effects were less pronounced when sodium bisulfite was substituted, and negligible when SO_2 from liquid SO_2 was used. Preservation of large pieces with SO_2 was effective, but required additional liquid for covering and offered more difficulty in the removal of SO_2. Blanching of sliced pineapple before sulfuring caused considerable loss of flavor and was unnecessary, since bromelin, the pineapple enzyme, was steadily inactivated during storage.

Brining and "maraschino-ing" cherries, W. V. Cruess. (Univ. Calif.). (*Canner, 96 (1943), No. 26, pp. 12–14, 26, 28, illus. 1*).—This article, based on several seasons' laboratory experience, deals chiefly with cherries for canning for use in cocktails and salads. It considers varieties and picking; brining in a water containing SO_2 or sulfite for bleaching and lime or calcium salts for hardening; barreling for the curing period, usually complete in 4–6 weeks; stemming, grading, and pitting; treatment to remove SO_2, which must be reduced to below 20 p. p. m.; and dyeing and flavoring.

Problems of fruit juice processing, C. S. Pederson and H. G. Beattie. (N. Y. State Expt. Sta.). (*Food in Canada, 4 (1944), No. 4, pp. 11–15*).—This review, presented as an address, is concerned with factors influencing the quality of processed juice. These factors involve the action of micro-organisms, the role of enzymes, the influence of air, the contamination by metals, the effect of heat, and the action of light.

Fruit tablets, a confection, W. V. Cruess. (Univ. Calif.). (*Canner, 99 (1944), No. 7, pp. 22*).—Suggestions are given briefly for the use of powdered dried fruits and fruit juice concentrates with dextrose or a fondant to make pressed or cast fruit tablets of interesting flavor and possibly increased food value.

Some problems in sauerkraut making, C. S. Pederson. (N. Y. State Expt. Sta.). (*Food Packer, 25 (1944), No. 5, pp. 46, 48, 64*).—Studies conducted upon various phases of sauerkraut manufacture have shown the following: A fully fermented kraut with a comparatively low salt content is essential for the production of a high grade dehydrated sauerkraut (from 28 to 47 percent of the acid is volatilized during dehydration); soft, pink, and spotted areas in kraut tanks may be due to lack of uniform distribution of the salt in packing; darkening of repacked kraut may be due to a combination of conditions, such as the retardation of fermentation by low temperature or high salt, the presence of certain types of micro-organisms on the cabbage, and the absence of germicidal substance in cabbage; filling at higher temperatures without the usual hot water cook results in more effective processing; and some method to produce a reduced condition such as exists in tin cans is necessary to maintain a satisfactory color in sauerkraut packed in containers other than tin.

Solubility studies on whole cloves, F. W. Fabian and H. J. Burtraw. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 7, pp. 196–199, 215, illus. 4; abs. in Michigan Sta. Quart. Bul., 27 (1944), No. 1, p. 157*).—The present work was carried out, in continuation of a previous study (E. S. R., 90, p. 148), to determine the effect of all factors, such as sugar, salt, and acetic and lactic acids, on the extraction of the essential oils from whole spices in a pickling liquor. Whole cloves were used as the representative test spice, and, in 25-gm. lots, were extracted for 7 days at room temperature with the different materials used in pickle manufacture. In the concentrations usually found in pickles, acetic acid (2 percent) dissolved about one-quarter and lactic acid (0.75–1.0 percent) about one-eighth to one-fifth of the amount of the essential oil present in cloves; salt (5 percent, as in dill pickles) extracted about one-twelfth of the oil; sugar (20° B., as in sweet pickles) about one-thirty-third; and a combination of acetic acid (2 percent), salt (1.5 percent), and sugar (20° B.) dissolved one-twentieth to one-fifth of the oils in the whole cloves. Under the conditions of pickle manufacture, the maximum amount of oil was withdrawn from the spice during the first day. Thereafter, there was a gradual reabsorption of the oil by the spice. The greatest amount of reabsorption took place from those solutions which extracted the least amount of oil from the spices.

Control of oxidative flavors in beverages, C. A. Shillinglaw and M. Levine. (Iowa State Col.). (*Food Res., 8 (1943), No. 6, pp. 453–463, illus. 1*).—The rate of oxygen uptake of orange juice as measured in a Warburg-Barcroft respirometer was found to be increased by pasteurization when the orange juice was fortified with added ascorbic acid; with the addition of ascorbic acid the rate of oxygen absorption in the presence of iron, and particularly copper, was very markedly increased. The period of flavor retention in orange juice was not appreciably affected by the addition of a commercial antioxidant preparation from oat flour; added vitamin B_1 in an orange beverage accelerated the rate of loss of flavor and resulted in the development of undesirable taste and odor. Normal taste and flavor of true-fruit orange and grapefruit beverages were retained for a longer period when ascorbic acid was added in concentrations in excess of that required to take up the free oxygen in the container. "Whether or not the addition of ascorbic acid increases the keeping qualities of beverages sufficiently to make the practice commercially feasible would probably be determined primarily on economic grounds. The results obtained indicated clearly the importance of keeping oxygen away from beverages containing fruit juice, in all stages of their manufacture."

Food buying for Vermont farm homes, M. Muse (*Vermont Sta. Bul. 514 (1944), pp. 54, illus. 4*).—This bulletin reports the findings of the fourth in a series of studies of buying by Vermont farm families (E. S. R., 84, p. 429). After a preliminary survey of all farm homemakers in three towns, 20 farm houses in each of five areas were selected for further interviews concerning food-buying habits. The stores in each area were visited in 1942 by station workers who obtained information concerning foods stocked, sanitary conditions, arrangement, location of scales, and types of record given to customers. A few sales transcations and weighings were observed, and the merchants were interviewed concerning the services they gave, matters of policy, and their evaluations of certain phases of consumer buying. From the observations of the kinds, quantities, and qualities of food purchased at the several centers studied, it is concluded that the following buying procedures would make for money savings:

"Choosing the lowest priced store offering the variety and quality of goods and the services demanded, provided that travel expenses do not increase food costs. Buying the various foods in the lowest priced quantities, provided they are suitable to the family's needs and that their keeping qualities and the available storage facilities are such as to prevent deterioration before supplies are completely used. Buying bulk foods if they are available, are of suitable quality, and are cheaper than packaged ones. Buying in the face of rising prices, at the bottom of seasonal price cycles, on special sales, and at any time when needed and storable foods of acceptable quality are offered at relatively low prices. Buying what is good enough but no better than is needed for the intended usage. Being informed as to existing laws for consumer protection and their enforcement, promoting the passage of needed legislation, and helping to bring about the enforcement of laws. Selecting a reliable merchant. Reading net weights as marked on labels, ascertaining prices and calculating costs of various quantities on the basis of a standard unit. Being on guard against error, carelessness, and fraud."

For better living in Brazil, J. L. Nordin (*U. S. Dept. Agr., Agr. in Americas, 4 (1944), No. 8, pp. 148–150, 156, illus. 3*).—This article by the nutritionist with the Brazilian field party of the Food Supply Division, U. S. Office of the Coordinator of Inter-American Affairs, discusses the training course for nutritionists organized in Rio de Janeiro, Brazil, under the auspices of the Serviço de Alimentação da Previdência Social (Social Welfare Feeding Service), cooperating with the Brazilian-American Food Production Commission. The general organization of the training course, the personnel of the teaching staff, and the selection of students and their placement after completion of the course are described, and plans are given for the establishment of a home demonstration service training school.

A short method of calculating the nutritive value of diets, G. H. Berryman and P. E. Howe (*Jour. Nutr., 27 (1944), No. 3, pp. 231–240*).—Following the procedure reported earlier (E. S. R., 90, p. 558) for estimating the nutritive value of Army diets (Field Ration A), tables of nutritive values of the "winter ration" used from November to April in 1941–42 and 1942–43 are presented in comparison with the values for the "summer ration" used from May 1941 to October 1941. The patterns for these two seasonal rations were sufficiently different as to result in variations in nutritive content, these variations being rather wide in respect to vitamins A and C. In winter, for example, the changing distribution of items in the groups of green leafy and yellow vegetables, tomato products, and fruits other than citrus, resulted in increased vitamin A values for these groups. Changes in vitamin C values were greatest in the green leafy or yellow vegetables and in the other vegetable groups. Estimates are presented to show that no correction is necessary due to the use of large quantities of boneless beef rather than carcass beef. It is considered advisable to use separate tables for the winter and summer months in preference to a single table for year-round use.

Planned and self-chosen low-cost diets: Cost and nutritive value of foods used and nutritive status of girls on the diet, R. M. Leverton and T. J. McMillan. (Nebr. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 4, pp. 225–229*).—To ascertain the practicability from the standpoint of palatability and adequacy over an extended period of a diet planned from one of the market lists for adequate low-cost meals suggested by the U. S. D. A. Bureau of Human Nutrition and Home Economics, one group of eight girls in the cooperative dormitory described in a previous paper (E. S. R., 90, p. 850) served as experimental subjects and two groups of six girls each as controls. For 6 mo., beginning in October 1942, the authors planned the menus for the first group from the suggested foods in the marketing list of the Bureau, selecting the foods so that, when consumed in quantities furnishing the calories (2,000) recommended for the sedentary woman, the meals would provide the nutritive values recommended for girls from 16–20 yr. of age. The other groups made their own food selections, which were recorded quantitatively for comparison.

The diets of the experimental group as compared with the controls were characterized by much larger amounts of potatoes, legumes, and nuts; almost identical amounts of milk, eggs, meat, cereals, fats and oils, and sugar; and similar total amounts of fruits and vegetables but more leafy, green, and yellow vegetables. They furnished all of the calculated nutrients in quantities equal to or greater than the National Research Council allowances except in calories (82 percent) and much greater amounts of thiamine and vitamin A, while the diets of the controls equaled or exceeded the standard allowances in vitamin A, thiamine, and ascorbic acid and furnished 98 percent of the standard allowance of riboflavin, 97 percent of calcium, 84 percent of protein, and 76 percent of calories. Both groups met or exceeded the individualized standard in all of the vitamins and the experimental group in protein. All percentages were higher for the experimental group than the controls. The meals for the two groups averaged $1.69 and $2.10, respectively, per person per week, with considerably higher percentages of the total spent by the experimental group for dairy products, fruits and vegetables, and meat, fish, and eggs and by the control groups for cereals, fats, and sweets.

To check the adequacy of the diets in certain respects, each month the hemoglobin and ascorbic acid in the blood of all of the subjects were determined and a biophotometric test for vitamin A was made, and at the end of the study the thiamine content of the blood and the thiamine and riboflavin excretions were determined. The results were very similar for the two groups except for thiamine, which unexpectedly showed considerably higher values for the experimental than the control group, and for slightly but consistently better values for vitamin A.

The girls in the experimental group were more satisfied with their diet than with their previous self-chosen meals and did not eat between meals as much as the control groups. There were no marked differences in good health or spirits.

Milk nutrition and human health, J. M. SHERMAN. (Cornell Univ.). (*Milk Dealer, 33 (1944), No. 11, pp. 96–100*).—An address.

Secondary anemia due to prolonged and exclusive milk feeding among Shoshone Indian infants, M. PIJOAN and C. A. ELKIN (*Jour. Nutr., 27 (1944), No. 1, pp. 67–75, illus. 1*).—Hemoglobin determinations, carried out on oxalated venous blood, indicated the presence of an anemia, secondary in nature, in Shoshone Indian infants. This was due to the continued and exclusive use of milk in their dietary for from 1 to 2 years' duration. Milk of 11 lactating Shoshone Indian women contained 1.59–1.84 mg. iron per liter. In 3 women studied for a number of weeks following parturition the iron content of the milk was found to be fairly constant, averaging about 1.72 mg. per liter. Iron in milk was determined by the method of Farrar (E. S. R., 75, p. 157) modified (1) by elimination of isoamyl alcohol and potassium permanganate, and (2) by change in volume of the other reagents. The elimination of the isoamyl alcohol was possible since color readings were made in a photoelectric colorimeter and no concentration of the chromogen was required; in such a system the oxidizing agent did not seem necessary.

Studies on the growth of rats raised on chocolate milk, G. W. NEWELL and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Science, 99 (1944), No. 2577, pp. 411–412*).—Young rats weighing 40–45 gm. were placed on experimental diets fed ad libitum and consisting of mineralized whole milk or partly skimmed milk or of mineralized chocolate milk made either from whole or partially skimmed milk, 86.3 parts, and chocolate sirup, 11.7 parts. The chocolate sirup contained 9.0 percent cocoa so that the final chocolate milk, a uniform product prepared daily for human consumption, contained but 1.05 percent cocoa. Weight gains after 4 weeks on this regime were as good, or better, for the animals fed the mineralized chocolate milk as for those fed the mineralized whole milk. Even after 16 weeks there was no significant difference in the weight response of the several groups. When the rats were carried through reproduction, normal young were produced in all cases, but the mothers on chocolate milk had some difficulty in rearing their young. Although man would not exist on a diet of chocolate milk alone, these results are considered as significant, as the growth response of rats on a mineralized milk is a critical measure of certain changes in the nutritive value of milk.

The effect of germination, the stage of maturity, and the variety upon the nutritive value of soybean protein, G. J. EVERSON, H. STEENBOCK, D. C. CEDERQUIST, and H. T. PARSONS. (Wis. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 3. pp. 225–229*).—Soybeans used raw or after autoclaving were incorporated at a 10-percent protein level (N × 5.7) in an adequate diet fed for 8 weeks to young male rats. The efficiency of the protein was judged by the gain in weight per gram of protein ingested. In addition, determinations were made of the percentage of ingested nitrogen that was absorbed. In the five varieties tested (Illini, Dunfield, Mansoy, Virginia Brown, and Mandarin), no appreciable varietal differences in protein value were observed. Heating greatly improved the protein of all varieties. The protein of freshly germinated Illini beans was superior in nutritive value to that of the unheated mature beans, although the percentage of nitrogen absorbed was not increased. Immature soybeans likewise supplied protein of higher nutritive value than that of raw mature beans. The protein of germinated and of immature soybeans was improved by heating.

The effect of excessive dietary sodium and potassium on the carbohydrate metabolism of normal rats, R. C. LEWIS, JR., F. S. MCKEE, and B. B. LONGWELL (*Jour. Nutr., 27 (1944), No. 1, pp. 11–21, illus. 2*).—Male albino rats of the Yale strain were maintained for 2 weeks on normal diets and on diets high in sodium and potassium. After a 24-hr. fast animals in these three groups showed essentially the same range and distribution of blood sugar levels, but when 0.5 gm. glucose per 100 gm. body weight was then introduced by stomach tube the glucose tolerance curves of animals fed excessive sodium tended to be lower than those of the control rats. The animals which received excessive sodium were more sensitive, and those which received excessive potassium were less sensitive, to administered insulin than were those on a control diet. Storage of glycogen in the liver following administration of a measured dose of glucose was not affected by excessive sodium ingestion but was significantly lowered by excessive potassium ingestions; when a 12-hr. standard feeding period was used instead of the single dose of glucose the high-sodium animals stored significantly greater amounts of liver glycogen than did the controls. The increase in respiratory quotient following administrations of glucose was not as marked nor as prolonged in the animals which had received excessive sodium as in those on the control diet; those that had received excessive potassium did not differ significantly from the controls. The results obtained were interpreted as evidence that the effect of NaCl is to increase the storage of carbohydrate in the experimental animal.

The efficiency of utilization of phosphorus by the albino rat, L. F. MARCY. (Pa. Expt. Sta.). (*Jour. Nutr., 28 (1944), No. 1, pp. 17–25*).—"The utilization of phytin, lecithin, and disodium phosphate phosphorus by growing albino rats was studied by means of balance experiments, efficiency of utilization being expressed as the difference in retention divided by the difference in intake. In one experiment disodium phosphate phosphorus and crude soybean lecithin phosphorus were utilized to the extent of 63.9 and 69.2 percent, respectively. Phytin phosphorus was utilized to the extent of 49.2 percent. The corresponding calcium utilizations were 41.9, 32.0, and 16.1 percent, respectively. In another experiment of longer duration the disodium phosphate phosphorus was utilized to the extent of 45.0 percent, and the phytin phosphorus to the extent of 42.5 percent. This low utilization of disodium phosphate phosphorus was apparently due to a low level of calcium in the ration which made calcium the limiting element instead of phosphorus. The corresponding calcium utilizations were 67.0 and 51.5 percent, respectively. The highest amount of phosphorus in the feces of the phytin rats apparently signified lower absorption. The pH values for intestinal contents of individual rats varied much, but the average pH value, 6.60, for the phytin rats was higher than that, 6.50, for the disodium phosphate rats. This higher average pH value for the intestinal contents of the phytin rats was associated with a lower utilization of phytin phosphorus. The intestinal wall extracts for both the disodium phosphate rats and the phytin rats showed the presence of a phytate-splitting enzyme. No correlation was found between the enzyme activity of the extracts and the utilization of phytin phosphorus. However, the pH of the intestine may influence the activity of the phytase."

The availability of the calcium and phosphorus of defluorinated rock phosphate for the rat, B. F. BARRENTINE, L. A. MAYNARD, and J. K. LOOSLI. (Cornell Univ.). (*Jour. Nutr., 27 (1944), No. 1, pp. 35–42, illus. 2*).—Two of the defluorinated phosphates were prepared by treating the rock phosphate with sulfuric acid to form superphosphate from which the excess acid and fluorine were driven off by heat treatment; the third product was prepared by fusing a mixture of rock phosphate and silica to expel the fluorine. These phosphates were incorporated at levels of about 0.7 to 7.0 percent in low calcium, low phosphorus diets to give diets containing from 0.15 percent phosphorus and 0.24 percent calcium to 1.0 percent phosphorus and about 2.0 percent calcium. The availability of the phosphorus of these products (as compared with that in calcium phosphate and bone meal) for growth and bone formation was observed in tests with rats fed these diets and then sacrificed to determine femur weight, specific gravity, and ash content. The findings indicated that one of the defluorinated phosphates inhibited the growth of the rats and was significantly less efficient for bone formation than calcium phosphate or bone meal. The other defluorinated phosphate was less available for bone formation than calcium phosphate at low levels, but at approximately twice the level of calcium phosphate gave equal bone formation. The fused rock phosphate was slightly less efficient than calcium phosphate at low levels, but at a level sufficient to supply 0.50 percent phosphorus or more was equally as satisfactory as the calcium phosphate for bone formation. It is suggested that the low availability of the phosphorus in the first two defluorinated superphosphates may have been due to the presence of the poorly utilized calcium metaphosphate. "While these results may not apply to farm animals, they suggest the importance of giving attention to procedures used in manufacturing defluorinated rock phosphates and testing these products with farm animals."

The copper metabolism and requirement of young women, R. M. Leverton and E. S. Binkley. (Nebr. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 1, pp. 43–53, illus. 1*).—This paper reports the copper metabolism data obtained from (1) 95 1-week metabolism studies of 65 healthy young women living on their customary self-chosen diets, and (2) a metabolism study of 4 healthy young women on an adequate constant diet for a continuous period of 75–140 days. The average daily intake by the subjects on the self-chosen diets was 2.65 mg. copper, and the average daily retention was 0.85 mg.; for the subjects on the constant diet these averages were 2.37 mg. and 0.23 mg., respectively. When the data were sorted according to the size of the intakes, it appeared that the excretions did not increase at the same rate as the intakes, so that there was an increased retention at each successively higher level of intake. When retention was calculated as the percentage of the increase in intake which was retained, it became apparent that a large proportion (over 50 percent) of each increase in copper intake was retained and that an increase in the intake to over 4.0 mg. still did not result in a diminished rate of absorption. Iron metabolism data for the larger group of subjects revealed likewise a high percentage absorption of increased iron intakes. The copper content of 16 menses for 4 subjects was found, unlike the iron losses (E. S. R., 76, p. 131), to vary greatly from period to period. The few negative balances, which seemed to be apparent rather than real, and the increasing percentage retention with increased intake suggested that the body does not excrete copper and that the intestinal tract may handle copper as it does iron. In the 16 cases with the lowest copper intake, 1.60 mg., there was a retention of 0.03 mg., and in 51 cases with intakes of 2.0–3.0 mg. the daily retentions averaged 0.77 mg. Moreover, 84 percent of the increased intake between the intakes of 1.60 and 2.48 mg. was retained. These lines of evidence suggest that a daily allowance of 2.0–2.5 mg. copper would be ample for young women. These amounts appear to be readily available from diets of otherwise mediocre nutritive value.

Hemoglobin-regenerating properties of prunes, A. F. Morgan, L. Perlman, and M. Groody. (Univ. Calif.). (*Food Res., 9 (1944), No. 2, pp. 154–163, illus. 1*).—Ca, Mg, P, Cu, and Fe were determined by methods noted in the ash of California French prunes. A preliminary comparison of two ashing procedures, (1) that of Walters, involving the use of $Ce(NO_3)_6$ as an ashing aid (E. S. R., 62, p. 710), and (2) the A. O. A. C. method (E. S. R., 85, p. 5), showed that for prunes the times consumed by the two methods were about the same and that the results were comparable, although the $Ce(NO_3)_6$ procedure offered somewhat greater precision. Total ash (normal basis) and the elements in the order Ca, Mg, P, Cu, and Fe amounted, respectively, to 1.95 percent, 0.069, 0.074, 0.136, 0.00085, and 0.0062 percent of the dry weight in the flesh of large prunes (from 20 to 30 per pound) and to 3.25, 0.109, 0.124, 0.176, 0.00101, and 0.0173 percent in the flesh of small prunes (120 per pound). This higher mineral content of the small prunes indicated a concentration of the minerals in the skins. Whole fruit and pits were relatively poor in ash and in iron.

"The regeneration of hemoglobin in rats made anemic by whole-milk diet was not as good at low levels of iron intake in animals given prunes as in those given inorganic iron and copper, but when small amounts of copper were given also, the prune iron became practically completely available. At the higher levels of iron intake the prune flesh and its ash were nearly equivalent to the inorganic iron, but the whole prunes, including pits and their ash, were somewhat less effective. It is concluded that prune iron is largely available for hemoglobin production, but its usefulness is limited at lower levels of intake by the prune copper content. The greying of the fur seen in the milk-fed rats was only partly remedied by iron and copper feeding as well as by pantothenic acid and unknowns in a concentrated yeast filtrate. Supplements of thiamine, pyridoxine, and riboflavin, however, improved hemoglobin regeneration and promoted some repigmentation."

The effects on respiratory metabolism produced by equal amounts of caffeine in the form of coffee, tea, and the pure alkaloid, J. HALDI, G. BACHMANN, C. ENSOR, and W. WYNN (*Jour. Nutr., 27 (1944), No. 4, pp. 287–293, illus. 1*).—In a comparative study of the gaseous exchange of two well-trained subjects following the ingestion of 200 mg. caffeine, it was found that the effect of the alkaloid was the same whether administered as a water solution of the pure alkaloid or as present in coffee and tea infusions. The rate of oxidation rose shortly after ingestion of the alkaloid, reaching a peak (14.3 percent above the basal) in the first 15-min. period in one subject and within 30 min. in the other (12.9 percent above basal); carbon dioxide eliminations likewise rose promptly, reaching a peak within 15 or 30 min. after ingestion of the caffeine. There was also a prompt rise in the respiratory quotient, which, with the exception of one experiment with tea, reached its peak in the second period. The respiratory quotient for 105 min. after ingestion (seven 15-min. periods) was 0.03 above the basal in one subject and 0.02 above in the other. This small rise was no greater than occurred in control experiments with decaffeinated coffee or in experiments in which water was taken, and it is concluded that the initial hyperventilation was a consequence of an increase in respiration and was completely compensated by the retention of carbon dioxide before conclusion of the experiment. Comparison of these results with those obtained with decaffeinated coffee and decaffeinated coffee to which caffeine had been added showed that the effect of coffee and tea was due solely to their caffeine content. It is concluded that the rate of absorption and the action of caffeine in coffee and tea is the same as that of the pure alkaloid in solution.

The retention of vitamins in pork hams during curing, B. S. SCHWEIGERT, J. M. MCINTIRE, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 5, pp. 419–424*).—In a previous report on this subject (E. S. R., 91, p. 223) the vitamin retentions in curing were calculated on the basis of the residual solids content (i. e. moisture-, fat-free basis) of the meat before and after treatment. Because of possible error in such calculations due to the salt content of the hams, retention values for these samples were recalculated on the basis of the protein content of the fresh and cured hams. Retentions thus calculated amounted to 84, 96, and 104 percent for thiamine, nicotinic acid, and riboflavin, respectively, as compared with the lower retentions of 73, 84, and 92 percent, respectively, as previously calculated on the basis of residual solids. To appraise the validity of the revised basis of calculation the experiment was repeated with four additional pairs of hams which were analyzed for their vitamin content, one ham of each pair being analyzed as a fresh sample and the other as a cured sample. Curing was done commercially, and the final weight of the cured ham was about 96 percent of the original weight of the fresh ham.

When the percentage of vitamin retention was calculated by dividing the total milligrams of vitamin in the cured meat by the total milligrams in the fresh meats, 80 percent of the thiamine, 97 percent of the riboflavin, and 100 percent of the nicotinic acid were found to be retained. When calculated on the basis of the vitamin content per gram of protein in the fresh and cured hams, the retentions were 85 percent of the thiamine, 104 percent of the riboflavin, and 106 percent of the nicotinic acid. The higher percentages obtained by the latter method may be associated with the lower protein values of the cured hams due to small losses of the soluble nitrogen constituents during the curing. "The best method of calculating the percentage of vitamin retention seems to be on the basis of the original and final weights of the samples tested. It is the most direct method, since it does not involve additional determinations and calculations which is the case when the protein content is used as the basis for calculation."

In the fresh hams the vitamin values ranged from 1.98–2.43 µg. per gram (fresh basis) for riboflavin; from 6.06–9.0 µg. per gram for thiamine; and from 15.0–27.7 µg. per gram for nicotinic acid. Comparisons of these values with data previously obtained and with values reported by other workers emphasized the rather wide variations in vitamin content per gram of fresh tissue.

Vitamin content of prepared cereal foods, G. KITZES and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Amer. Med. Assoc., 126 (1944), No. 2, pp. 100–101*).—This study, for which preliminary data were presented earlier (E. S. R., 91, p. 487), involved analyses of a number of samples each of many prepared cereal foods, including the ones derived from wheat, corn, oats, and rice, and products restored or enriched by additions of synthetic vitamins or vitamin concentrates. The samples were obtained on local markets at three different periods, namely, spring, summer, and fall of 1943. It is pointed out that samples of the same product obtained from different stores showed surprisingly little variation, indicating excellent progress by cereal manufacturers in standardizing their products. Restored and enriched products and some of those very low in thiamine showed the greatest variation. The thiamine values for practically all the corn, oats, and rice products were within the range of values for whole grains. Very few of the riboflavin values fell below the corresponding minimum for whole grains. The biggest discrepancy between whole grains and the cereal products was in the niacin values, due to the fact that the niacin-rich bran layer of the wheat is generally removed in the preparation of wheat products. A very great lack of uniformity was observed in the manner of expressing nutritional values on the packages, and suggestions, primarily addressed to the manufacturers, are offered for a more uniform system of advising the consumer of the nutritional values of the cereal products.

Vitamin content of prunes as affected by storage and other factors, A. F. MORGAN, L. S. BENTLEY, and M. GROODY. (Univ. Calif.). (*Food Res., 9 (1944), No. 2, pp. 132–147, illus 2*).—The French prunes utilized in this study included samples from different crop years, samples that varied in size and storage conditions, processed and unprocessed samples, and raw or cooked samples, with or without previous spray treatment with prune-pit oil. The pleasant light oil extracted from the cracked pits and kernels contained from 40 to 50 U. S. P. units of vitamin A per gram and made an acceptable glossy coating for dried prunes. This coating prevented "sugaring" of the surface and insect infestation during storage. It had no effect upon vitamin retention.

The flesh, skin, paste, and water-extracted prune pulp of the usual market prune were found by biological method to contain from 16 to 27 International Units of vitamin A per gram (23 to 34 I. U. per gram of dry matter).

The thiamine content of four lots of dehydrated prunes stored 10 mo. and with various pretreatments was found by biological assay to be approximately 0.3 to 0.4 mg. per 100 gm. (0.5 mg. per 100 gm. dry basis).

As determined by the biological method, the riboflavin value varied in samples of different crop years, but ranged from 0.5 to 1.3 mg. per 100 gm. of prune flesh (0.7 to 1.8 mg. per 100 gm. dry basis). Microbiological determinations of riboflavin gave lower values than biological methods, apparently due to incomplete extractions in the microbiological procedure. A new fluorimetric technic developed yielded values similar to those obtained by rat growth assay. Pyridoxine determined by rat growth assays in these prunes was somewhat lowered by cooking but not by storage. There were 0.4 to 1.2 mg. of pyridoxine per 100 gm. of market prunes. Microbiological and biological assay of prunes revealed the same discrepancy for pantothenic acid as for riboflavin. Biological assay indicated "filtrate-factor" activity equivalent to that of 2 to 7 mg. of pantothenic acid per 100 gm. of market prunes. Nicotinic acid, as determined microbiologically, amounted to 1.5 mg. per 100 gm. of market prunes (2.2 mg. dry basis). This vitamin was not affected by the drying processes.

Vitamin E activity in amount equivalent to that of 3 mg. of α-tocopherol was found in the ether extract of 100 gm. of prune pulp or in 2.7 gm. of the prune-pit oil.

The production of vitamins in germinated peas, soybeans, and other beans, C. E. French, G. H. Berryman, J. T. Goorley, H. A. Harper, D. M. Harkness, and E. J. Thacker (*Jour. Nutr., 28 (1944), No. 1, pp. 63–70*).—Soybeans (six varieties), other beans (including lima and kidney beans), and peas (cowpeas also included) were sprouted by a definite procedure permitting daily removal of a weighed portion of the beans for vitamin analysis. Some signs of germination were usually observed at the end of 24 hr., and in most cases sprouts were fully evident in 48 hr. The rate of germination and the rate of vitamin formation were observed to be directly correlated with the temperature of the room. At summer temperature (daily range about 68°–97° F.), the sprouts attained a 2-mm. length in about 72 hr.

Ascorbic acid was determined by the method of Mindlin and Butler (E. S. R., 80, p. 728) modified with respect to the preparation of the samples to provide for effective removal of the proteins and other interfering substances. In the method developed an aliquot of the extract obtained by macerating the sprouted beans with 2 percent metaphosphoric acid in a Waring blender was treated for 15 min. with 1/5 volume of 25 percent trichloroacetic acid. The precipitated substances were removed by centrifugation and an aliquot of the supernatant solution was used for photocolorimetric determination of ascorbic acid with 2,6-dichlorophenolindophenol. The other vitamins were determined by methods noted—thiamine by a thiochrome procedure, and riboflavin and nicotinic acid by microbiological procedures. The germination caused a marked increase in ascorbic acid, a fair increase in riboflavin and nicotinic acid, and none in thiamine. Generally speaking, the Alaska and wrinkled peas and the black-eyed cowpeas produced the greatest quantities of ascorbic acid, riboflavin, and nicotinic acid. Soybeans were less efficient in this regard, but markedly superior to the other types of beans, which showed a tendency to rot. The vitamin values of the several kinds of sprouted peas at the end of 72 hr. averaged 26.0, 0.26, 0.28, and 1.52 mg. per 100 gm. of moist legume for ascorbic acid, thiamine, riboflavin, and nicotinic acid, respectively; corresponding values for the six varieties of soybeans were 13.5, 0.29, 0.46, and 1.09 mg. per 100 gm.

Vitamin losses in commercially produced dehydrated vegetables, cabbage, potatoes, carrots, and onions, A. F. Morgan, B. C. Carl, M. C. Hunner, L. E. Kidder, M. Hummel, and J. M. Peat. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 7, pp. 207–211, 219, 221*).—Thirteen lots of fresh, blanched, and dehydrated potatoes, cabbage, carrots, and onions (these not blanched) were obtained from California commercial dehydration plants and assayed immediately by chemical and microbiological methods for their content of thiamine, riboflavin, ascorbic acid, niacin, and pantothenic acid; carotene was also determined in the carrots. The data for total solids and for the vitamins on the moist and moisture-free basis are reported in detail, and pertinent information about the samples is tabulated. Losses in vitamins due to blanching and dehydration were calculated from the vitamin content on the dry basis. The vitamin assays were repeated on the dehydrated samples, stored 4–6 mo. at 36°, 65°, and 90° F., packed in tightly covered glass fruit jars, some in air, and some in an atmosphere of CO_2. Fresh and dehydrated samples, after being cooked, were compared as to palatability and water uptake.

Vitamin values for the freshly dehydrated vegetables, in milligrams per hundred grams were 0.30, 0.16, 0.16, and 0.27 for the thiamine in cabbage, potatoes, carrots, and onions, respectively; 0.38, 0.27, 0.42, and 0.08 for the riboflavin in these same vegetables; 2.7, 2.2, 2.0, and 0.8 for niacin, and 1.0, 0.8, 1.0, and 0.8 for pantothenic acid. Ascorbic acid in cabbage, carrots, and onions, respectively, averaged 235, 20, and 30 mg. per 100 gm.; and carotene in carrots averaged 69 mg. per 100 gm. In the dehydration of fresh vegetables 22–56 percent of the thiamine was lost, partly in blanching, partly in dehydration; riboflavin showed no consistent losses; niacin appeared fully retained, except in three cases; pantothenic acid was fully retained; and ascorbic acid disappeared to the extent of 16–83 percent in all but five cases. A sulfured dehydrated cabbage retained more than the similar unsulfured sample, and one dehydrated potato retained nearly all of its ascorbic acid, while the other lost all; carotene was retained in two samples of the carrots and partly lost in three others, the loss occurring directly in dehydration.

"After storage for 4 mo. at 90°, both cabbage samples and one potato sample were discolored and unacceptable. The other potato sample, however, and all the carrots and onions were in fair condition, as were all the vegetables stored at 36° and 65°, except the cabbage. About one-half the niacin, 12 to 50 percent of the ascorbic acid, 37 to 100 percent of the riboflavin, all of the thiamine, and 36 to 64 percent of the carotene of the freshly dehydrated vegetables remained in the stored samples. Storage in CO_2 did not affect niacin, thiamine, or riboflavin, but improved the retention of ascorbic acid and carotene."

[Carotene and ascorbic acid in Rhode Island grown vegetables] (*Rhode Island Sta. Rpt. [1943], pp. 12–14*).—This progress report, covering the results of one season's analyses of peppers, peas, beets, and carrots, indicates that different varieties of carrots showed significant variations in carotene and ascorbic acid content, but that peas and table beet varieties showed no significant differences. Vitamin C variations were significant among pepper varieties, while carotene differences were very small. Prior to turning red, the ascorbic acid in the edible portion of peppers increased and the carotene decreased as the fruit increased in size, but with ripening to the red stage the carotene increased from an average of 0.4 mg. percent to 13.1 mg. percent, and ascorbic acid increased from an average of 136.1 mg. percent for the green stage to 202.5 mg. percent in red fruits. As peas became overmature the ascorbic acid concentration decreased 39 percent and the carotene showed little change. Beet tops were comparatively high in carotene (2.8 mg. percent, average for all varieties), but the roots contained none. The beet tops varied with variety in ascorbic acid content from 28.6 to 35.6 mg. percent, but these differences were not apparent in the roots, which averaged 13.9 mg. percent for all varieties. In the tops most of the ascorbic acid was in the leaf blade. Carotene in carrots was correlated with pigmentation and increased with age and size of root; maximum concentration occurred 90 days from seeding.

Carotene degradation in dehydrated carrots.—I, Cytological changes in carotene and fat droplets under conditions favorable for carotene degradation, T. E. Weier. (Univ. Calif.). (*Amer. Jour. Bot., 31 (1944), No. 6, pp. 342–346*).—

The cytological studies reported here demonstrated that changes similar in appearance to those taking place in dehydrated carrots after 3–8-mo. storage could be produced experimentally in a few hours under proper conditions. When carrots were heated, carotene normally present in the cells was found to be in solution in fat droplets that formed. The stain reactions indicated that the fat in these droplets was unsaturated. When the carrots were heated in moist air at 62° C. for 24 hr. the carotene disappeared from this fat, apparently due to a breakdown of the carotene. This breakdown was speeded in the presence of an atmosphere of oxygen; was unaffected by chloroform, toluene, or immersion of the carrot pieces in paraffin; but was inhibited by hydrogen, ammonia, carbon dioxide, and immersion of the carrot pieces in water. After the carotene had disappeared from the fat droplets in the cells, the droplets showed a positive Schiff reaction, indicating the presence of aldehydes or other change in the fat. This positive Schiff test was also shown after rehydration by unblanched dehydrated carrots 8-months-old. When placed in moist oxygen at 62°, they lost their carotene completely and showed a strong positive Schiff test. Commercial blanched dehydrated carrots, 8-months-old, also showed after rehydration a positive Schiff test on some surfaces. These carrot pieces showed loss of carotene when held in moist oxygen at 62°. The loss was variable in degree within 24 hr. and complete after 48 hr. The system responsible for the breakdown of carotene was inactivated by heating the undried diced carrots immersed in a water bath of 80° for 5 min. When the carrot pieces were heated to 80°–100°, then dried and refreshed in the bath, the rate of the breakdown of the carotene was found to be slowed but not stopped, for within 48 hr. all the carotene had disappeared.

Vitamin A activity of lean meat and fat from cattle fed various levels of carotene, C. A. Cabell, N. R. Ellis, and L. L. Madsen. (U. S. D. A.). (*Food Res., 8 (1943), No. 6, pp. 496–501*).—The raw fat samples taken for assay consisted of composites of the outside fat covering the twelfth-rib cuts; samples from cattle fed at the Virginia Experiment Station were taken from the left side of each carcass, leaving those from the right side for analysis after roasting the rib cuts to an internal temperature of 70° C.; the samples of raw lean from Texas-fed and Beltsville (Md.)-fed animals consisted of the lean and intramuscular fat from the twelfth-rib cuts. Biological assays conducted essentially according to the U. S. P. XI method were supplemented in some cases by spectrophotometric analyses.

The high level of carotene intake of the pasture-fattened cattle fed at the Virginia Station resulted in raw rib fat containing from 600–660 International Units of vitamin A per 100 gm., whereas the carotene value for rib fat from corresponding animals receiving only moderate amounts of carotene in a grain and mixed hay ration was about 420–450 I. U. per 100 gm. Roasting of the beef fat resulted in destruction of some of the vitamin A activity, as indicated by lower biological values (450–540 and 270–335 I. U. per 100 gm., respectively) and very poor spectographic absorption curves from carotene-containing extracts of the cooked fat.

Texas beef cattle maintained on a carotene level of 1,250 μg. carotene per 100 lb. of body weight showed a vitamin A content of 33 I. U. per 100 gm. of fat and 14 I. U. per 100 gm. of lean; when carotene intake was raised to the 5,000-μg. level, vitamin A values of fat and lean were 96 and 33 I. U. per 100 gm., respectively. The carotene intake of 2,500 μg. per 100 lb. body weight was apparently not sufficient to permit storage, since vitamin A values of fat and lean were no higher than on the 1,250-μg. level of intake. In the Beltsville studies fat and lean from dry-lot-fed steers on a grain ration restricted in carotene were as low in vitamin A as the tissues from a cow showing vitamin A deficiency. The several experiments are interpreted to indicate that carotene intake of cattle is a controlling factor in the vitamin A content of edible beef cuts, including both fat and lean portions.

Vitamin A storage and factors that affect the liver, C. C. CLAYTON and C. A. BAUMANN. (Wis. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 2, pp. 155–164, illus. 1*).—In this study of the hepatic storage of vitamin A in rats or mice fed substances that in one way or another modified biochemical reactions taking place in the liver, initial stores of the vitamin were established in groups of animals comparable in weight and previous vitamin intake by feeding halibut-liver oil, and the various groups within the series were then fed a diet free from vitamin A but involving other modifications. After 6 or 8 weeks, the animals were killed and the vitamin A contents of their livers determined colorimetrically by the method described by Davies (E. S. R., 72, p. 584).

p-Dimethylaminoazobenzene, a potent agent for the production of liver tumors in animals, 3,3′-methylenebis (4-hydroxycoumarin), which depresses prothrombin synthesis, and vitamin K, which promotes this synthesis, were without effect on the rate of depletion of preformed vitamin A. The retention of the vitamin was essentially the same on diets high or low in fat, the rate of depletion of the vitamin was the same in fatty as in normal livers, and choline deficiency had no effect. "These results all suggest that vitamin A is stored in the liver and released therefrom by a mechanism that is comparatively independent of other processes taking place in this organ. . . . It would thus appear that many chemical reactions proceed in the liver independently of one another, and that a mild derangement of one does not necessarily interfere with the others. In severe hepatic failure, on the contrary, it would obviously be possible for more than one process to be affected."

The B vitamin content of groats and rolled oats, J. M. COOPERMAN and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr., 27 (1944), No. 4, pp. 329–333*).—Hulled oats (groats) and rolled oats prepared from them were obtained from three commercial mills located at Cedar Rapids, Iowa, Akron, Ohio, and St. Joseph, Mo. In the nine samples of groats the vitamin values in milligrams per 100 gm. showed the following ranges: Thiamine 0.612–0.830, nicotinic acid 0.69–0.96, pyridoxine 0.104–0.148, pantothenic acid 1.17–1.82, and riboflavin 0.126–0.167. The rolled oats, in general, contained slightly less of each vitamin than the corresponding sample of groats, but the differences were small and in many cases the apparent loss was within the limits of experimental error. There was a tendency for the groats and rolled oats from the mill at St. Joseph, Mo., to be higher in all the B vitamins determined; this may have been due to variations in oats obtained in different regions. When 14 varieties of oats grown on well-fertilized plats and harvested under controlled conditions were experimentally hand hulled, the vitamin values in milligrams per 100 gm. averaged 1.15 for thiamine, 1.095 for nicotinic acid, 0.195 for pyridoxine, 2.50 for pantothenic acid, and 0.164 for riboflavin. No one variety was consistently higher than the other in all the vitamins. The analytical or assay methods used are described briefly and involved microbiological procedures, except for thiamine which was determined by a thiochrome fluorescence method. The methods were very satisfactory and gave almost identical results when the same sample was analyzed at different periods, but some difficulty was encountered when thiamine was determined on the same original sample ground under slightly different conditions. It is suggested, therefore, that a 10 percent differential be allowed in the thiamine results.

Riboflavin, niacin, and pantothenic acid contents of grain sorghums, G. KNOX, V. G. HELLER, and J. B. SIEGLINGER. (Okla. A. and M. Col. and U. S. D. A.). (*Food Res., 9 (1944), No. 2, pp. 89–91*).—Riboflavin, niacin, and pantothenic acid were determined by microbiological procedures in 29 varieties of sorghum raised in two locations in Oklahoma in 1941 and 1942. The data, reported in micrograms per gram, showed riboflavin contents varying from 1.17–2.08, niacin contents from 20.5–83.6, and pantothenic acid values from 10.32–15.88. The niacin content of the brown-coated varieties was much higher than that of the other varieties.

Riboflavin content of immature Massachusetts lettuce, A. D. HOLMES. (Mass. Expt. Sta.). (*Food Res., 9 (1944), No. 2, pp. 121–125*).—Boston head lettuce grown in Massachusetts under known soil, fertilizer, and climatic conditions was used for this study, being picked before heading while the leaves were spread out and exposed to light or sunshine. Riboflavin was determined fluorometrically by a procedure briefly outlined in a dilute acid extract of the finely cut leaves of crisp lettuce sampled within 20 min. after picking. Seventeen samples gave an average value of 0.124 mg. per 100 gm. It is pointed out that this immature lettuce contained over 80 percent as much riboflavin as milk produced by cows that consumed forage crops grown on similar soil.

Effect of refrigeration on retention of ascorbic acid in vegetables, M. ZEPPLIN and C. A. ELVEHJEM. (Univ. Wis.). (*Food Res., 9 (1944), No. 2, pp. 100–111, illus. 2*).—Ascorbic acid was determined in a series of samples, including some placed in the acid-extraction solution at the garden, others packed in crushed ice and taken to the laboratory for sampling within the hour, some held with or without packing in crushed ice at room temperature or at 6°–7° C., and others in home and store models of ice and mechanical refrigerators. Ascorbic acid was determined in 3.25 percent metaphosphoric acid extracts of the plant tissues, with a buffered solution of 2,6-dichlorophenolindophenol and with readings in a photoelectric colorimeter. The data for the several vegetables (chard, lettuce, spinach, broccoli, and green beans) are presented by table or by graph.

The results showed that all vegetables lost ascorbic acid at a rapid rate if held after harvest at room temperature (20°–23° C.). The rate of loss varied with the different vegetables, being most rapid in lettuce and spinach and less rapid in broccoli, green beans, and Swiss chard. Lettuce had a greater proportion of its vitamin C in the form of dehydroascorbic acid than the other vegetables, and broccoli had the smallest proportion; the proportion varied not only with the vegetables, but also with the storage period. It was found, however, that if relative rather than actual values were desired, the reduced ascorbic acid alone gave reliable results. Sprinkling room-stored lettuce to keep it "fresh" was not effective in preserving the total ascorbic acid, but did appear to decrease the amount found in the oxidized form. Packing the vegetables in crushed ice as soon as harvested in the field was effective in greatly reducing the ascorbic acid destruction during the transportation and storage; Swiss chard kept iced for 3 days lost no ascorbic acid, broccoli 10 percent, lettuce 20 percent, and green beans 30 percent.

Storage of the vegetables in either the mechanical or ice refrigerators had a marked and favorable effect on retention of ascorbic acid. Retail store ice or mechanical refrigerators appeared to provide better conditions for the protection of ascorbic acid than the smaller household models; however, the retail ice display cases seemed to offer the best protection for the ascorbic acid in most vegetables when the vegetables were placed directly on the ice.

"The factors involved in the retention or loss of ascorbic acid may include the physical conditions of the vegetables, humidity and temperature of the storage, and exposure to oxidation."

Effect of various home practices on ascorbic acid content of cabbage, F. O. VAN DUYNE, J. T. CHASE, and J. I. SIMPSON. (Univ. Ill.). (*Food Res., 9 (1944), No. 2, pp. 164–173*).—This study was conducted with cabbages of known varieties raised and harvested under known conditions. Ascorbic acid was determined in 3 percent metaphosphoric acid extracts of 10-gm. samples by the dye titration method of Bessey (E. S. R., 82, p. 14). The effects of different cooking procedures, of advance preparation of the cabbage, and of preliminary storage of the cabbage were observed. The results, presented and discussed in some detail, are summarized as follows:

"The ascorbic acid content of cabbage did not decrease when freshly harvested heads were stored in closed containers at -0.5° to 4° C. (31° to 39° F.) for 2 mo. or when the heads were kept in the refrigerator for a week. Losses of ascorbic acid occurred during the third month of storage and when cabbage was held at room temperature for 3 days. When cabbage was boiled for 7 min. in the proportions of 1 part by weight of cabbage to ½, 2, and 4 parts of water, the percentage retention of ascorbic acid decreased as the volume of cooking water increased. When cabbage was placed in twice its weight of boiling water and boiled for 7-, 15-, and 25-min. periods there was no significant difference in the ascorbic acid retention of the three cooked samples. Cabbage was cooked to the same degree of 'doneness' by three methods: Boiling covered in twice its weight of water for 7 min., boiling uncovered in twice its weight of water for 8.5 min., and boiling uncovered in four times its weight of water for 5.5 min. Slightly more ascorbic acid was retained when cabbage was cooked by the first method, while no differences in ascorbic acid content were observed [with] the second and third methods. When the cooked cabbage was held in the refrigerator for 1 and 3 days and then reheated, there were additional losses of approximately 28 and 33 percent of the original ascorbic acid. Losses in ascorbic acid content owing to advance preparation (shredding cabbage and allowing it to stand for 1 hr. in air or for 1 and 3 hr. in water) did not exceed 6 ± 1 percent."

Ascorbic acid losses in cooked vegetables, M. G. IRESON and M. S. EHEART. (Va. A. & M. Col.). (*Jour. Home Econ., 36 (1944), No. 3, pp. 160–165*).—Snap beans, cabbage, and potatoes were cooked in a large volume of water in an uncovered utensil and compared for ascorbic acid content with those cooked in a small amount of water in a tightly covered utensil. The data, tabulated in detail, indicate that the volume of water used in cooking did not cause a significant difference in ascorbic acid losses for the beans and potatoes, which were cooked whole or in large pieces. In the case of cabbage, cut into pieces ½ to ¾ in. thick, the loss of ascorbic acid was increased from about 16 percent for a small amount of water to 46 percent for a large quantity of water.

Cabbage cooked in the smallest possible amount of water contained about 29 mg. of ascorbic acid in an average serving, or more than one-third of an adult man's requirement. One serving of snap beans or potatoes, cooked by either method, would furnish only from 5 to 10 percent of the daily requirement.

Effect of time and temperature of storage on vitamin C retention in canned citrus juices, E. Ross (*Food Res., 9 (1944), No. 1, pp. 27–33, illus. 1*).—Ascorbic acid was determined in most of the samples by a slight modification of the method of Bessey and King (E. S. R., 71, p. 137), since it was found that for these juices the extraction of the centrifuged solids with hot 8-percent acetic acid was not necessary; the determination was carried out, therefore, by direct titration of the untreated juice with 0.05 percent aqueous solution of sodium 2,6-dichlorobenzenoneindophenol. The first pink coloration, lasting for at least 5 sec., was found to be a satisfactory end point. The dye was standardized by titration against a weighed quantity of dry ascorbic acid to which about 0.1 gm. of citric acid had been added.

Four lots each of freshly reamed orange juice (sweetened) and grapefruit juice (sweetened and unsweetened) contained, respectively, 0.38–0.59 mg. and 0.37–0.50 mg. ascorbic acid per cubic centimeter. The ascorbic acid potency of these juices as newly canned ranged from 92–98 percent of that of the freshly reamed juice. After 12 mo. of storage at room temperature the ascorbic acid content was found to range from 70–80 percent of that of the fresh juice. In other tests, storage temperature was found to be very important to ascorbic acid retention in the canned juices. At 17° C. retention was very good, while under refrigeration 90 percent of the ascorbic acid of the freshly reamed juice was retained after 1 yr.

"Temperature effect was found to be disproportionately high at the higher temperatures. From 27° to 37° the rate of reaction of the vitamin C quadrupled, while between 10° and 27° the rate only doubled for a 10° rise in temperature. Flavor was judged to be dependent on both time and temperature of storage, roughly paralleling vitamin C retention. The vitamin C in citrus juices in open containers is very stable. More than 95 percent of the original (open can or freshly extracted juice) vitamin C was retained after 48 hours' storage in the refrigerator."

A note on ascorbic acid : nitrogen relationship in grapefruit, W. W. Jones, C. W. Van Horn, A. H. Finch, M. C. Smith, and E. Caldwell. (Ariz. Expt. Sta.). (*Science, 99 (1944), No. 2562, pp. 103–104, illus. 1*).—An earlier study by Martin of Marsh grapefruit in Arizona (E. S. R., 88, p. 635) revealed certain influences of seasonal nitrogen supplies. Continuing this study, a total of 540 representative fruits was harvested at weekly or biweekly intervals from September 28, 1942, to January 31, 1943, from trees from high-nitrogen and low-nitrogen experimental plats. These fruits were analyzed separately for volume of juice, pH, total acidity, Brix : acid ratio, and ascorbic acid content. The latter was determined by the method of Morell, the bleaching effect of ascorbic acid on the 2,6-dichlorobenzenoneindophenol (I) being measured by the Evelyn photoelectric colorimeter. The tabulated results showed that fruit from trees handled to give a low nitrogen content at harvest averaged, by trees, from 0.44 to 0.48 mg. ascorbic acid per cubic centimeter, these amounts being from 20 to 25 percent higher than the 0.35 to 0.41 mg. per cubic centimeter in fruits from trees in which a higher nitrogen plane prevailed. These findings were supported by the results of nitrogen and ascorbic acid determination (the latter by the visual titration with (I)) on juices from composited samples of representative fruits from trees in the experimental plats. The data, presented by graph, showed a negative coefficient of 0.91 between the nitrogen and ascorbic acid content of the juices. Ascorbic acid values as high as 0.8 mg. per cubic centimeter were obtained from some juices, but at the same time nitrogen values were very low (about 0.4 mg. per cubic centimeter).

Blood plasma ascorbic acid values resulting from normally encountered intakes of this vitamin and indicated human requirements, M. L. Dodds, F. L. MacLeod, et al. (Tenn. Expt. Sta. and Univ.). (*Jour. Nutr., 27 (1944), No. 1, pp. 77–87, illus. 2*).—This study differs from some of the more recent attempts to determine ascorbic acid requirements from blood plasma levels in that there were no preliminary saturation periods and in changing from one given intake of ascorbic acid to another there were no intermediate periods in which large test doses were given. Data were collected from 4 subjects in 1942 and 8 in 1943 during January, February, and March. The basal diet, which was essentially that of Belser, Hauck, and Storvick (E. S. R., 82, p. 428), furnished 10.2 ± 0.47 mg. ascorbic acid daily in the 1942 experiments and 6.9 ± 0.36 mg. in 1943. This was supplemented by synthetic ascorbic acid in increasing doses at 2-week intervals of 25, 50, 75, and 100 mg. Fasting blood samples were taken each morning for ascorbic acid analyses, and during the last half of the second study 24-hr. urine samples were collected daily from 3 of the subjects who had shown low, medium, and high plasma levels. At the end of this study, all 8 subjects were given a test dose of 400 mg. ascorbic acid and 24-hr. urine samples were again taken.

At each level of intake, the plasma ascorbic acid values showed daily fluctuations which tended to be quite regular in amplitude and in time intervals between successive high and low values with a rhythm more or less characteristic for each individual. On the lowest intake, amounting to a total of 32 to 35 mg. daily, there was a general decrease in plasma levels. During the first week on the next higher level (57 to 60 mg.) the values tended to approach and during the second week to equal or exceed the initial values, although with extreme averages of 0.44 and 1.25 mg. percent. In 8 of the 12 subjects of both years, the 82- to 85-mg. intake brought the average to approximately the same as or even greater than those found later on the 107- to 110-mg. intake. The 1 subject who failed to show an increase in plasma levels during the previous period also showed an increase at this time. At the final level of 107 to 110 mg., only 4 of the subjects gave higher values than at the preceding level. At the close of the experiment, all but 3 of the subjects were found to be saturated, as judged by the urinary return of over half the test dose.

Of the 3 subjects selected for the urinary excretion tests, 2 were approximately the same age, 22 and 23 yr., and 1 considerably older, 41 yr. Their respective weights were 51.4, 66.4, and 61.8 kg. The average retentions for the first and third subjects were approximately the same and lower than for the second. When calculated in terms of body weight, however, the values for the first and second (the younger subjects) were almost identical, averaging during the sixth and eighth weeks of the experiment 1.10 and 1.075 mg. per kilogram, and somewhat higher than for the older subject, which averaged 0.87 mg. per kilogram.

The minimum ascorbic acid need of adults, E. D. Kyhos, E. S. Gordon, M. S. Kimble, and E. L. Sevringhaus (*Jour. Nutr., 27 (1944), No. 3, pp. 271–285, illus. 5*).—The vitamin C nutrition of 71 male prisoners at the Wisconsin State Prison was followed by means of frequent plasma tests and examination of the gums over a period of 17 mo., during which certain groups were given graded doses of ascorbic acid as a supplement to the prison diet, which was very low in vitamin C.

On first examination, 77 percent of the subjects had plasma ascorbic acid values below 0.2 mg. percent, 20 percent between 0.2 and 0.6 mg. percent, and 3 percent (2 subjects) over 0.6 mg. percent. There was only 1 subject whose gums appeared normal and free from disease. His plasma ascorbic acid reading was 0.95 mg. percent, the highest figure found in any untreated subject, and his dietary sheet showed regular daily consumption of one or two oranges for over 2 yr. In 12 men who were started on 25 mg. of ascorbic acid daily, the initial low plasma values (all below 0.2 mg. percent) did not rise significantly in 5 weeks, but definite improvement in the condition of the oral tissues was evident after only a month. An increase in the ascorbic acid dosage to 50 mg. brought about a definite increase in plasma levels and further improvement in the appearance of the gums, but this amount was not sufficient to maintain a plasma level of 0.8 mg. percent during the winter and spring months. In tests with other groups on various doses, 75 mg. appeared sufficient for most of the men throughout the year. The few cases refractory to this dosage responded within 4 to 5 weeks to 100 mg. daily.

It is concluded that the probable minimum daily requirement of ascorbic acid for healthy male adults lies in the neighborhood of 75 mg. The suggestion is made that "ascorbic acid in institutional diets should be provided for by citrus and other fresh fruits, by increased amounts of tomatoes either fresh or canned (but not reheated), by supplements of synthetic ascorbic acid, or by a combination of these."

The production of hypercalcemia with small amounts of vitamin D, J. H. Jones (*Jour. Nutr., 28 (1944), No. 1, pp. 7–16*).—The inclusion of 1 International Unit of vitamin D per gram in a diet very low in phosphorus (0.02 or 0.04 percent) and high in calcium (0.55 or 1.00 percent) produced pronounced hypercalcemia in rats, their growth was inhibited, and there was an increase in bone calcification. Irradiated ergosterol, pure calciferol, or irradiated 7-dehydrocholesterol were equally effective, whereas dihydrotachysterol (A. T.–10) was much less effective. When the calcium was reduced to 0.33 percent, with phosphorus at 0.02 percent, the addition of vitamin D did not inhibit growth, and serum calcium and bone calcification were reduced. With calcium reduced to as low as 0.03 percent and phosphorus at 0.02 percent, pronounced rickets and low serum phosphorus resulted. "The degree of hypercalcemia produced by vitamin D was found to be dependent on the amount of calcium in the diet. Growth was inhibited only in those animals in which there was a rather marked hypercalcemia. In general, the extent to which growth was inhibited was directly related to the degree of hypercalcemia. Calcification, as judged by either the absolute or relative amounts of femur ash, was greater in those cases in which there was a definitive increase in serium calcium. These data (1) give additional evidence in favor of the view that vitamin D increases the absorption of calcium from the intestines, and (2) serve to emphasize the importance of the calcium-phosphorus product of the serum in calcification."

TEXTILES AND CLOTHING

Benefits to the nation's families through research in textiles and clothing, E. L. Phelps. (Minn. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 7, pp. 423–427*).—This brief review deals with textile research over the period 1942–44 on such problems as clothing supplies and expenditures; selection and use of textile products, including hose, blankets, towels and toweling, material for uniforms, and material for work garments; fiber composition and fabric behavior; the maintenance of textiles and clothing; and consumer education as to expected fabric quality.

Physical-chemical properties of textile nylon yarns (*Rayon Textile Mo., 25 (1944), Nos. 4, pp. 51–53, illus. 1; 5, pp. 53–55*).—The data and information presented are offered as a basis for further experimental work. The following properties are considered: Tensile strength and elongation, chemical resistance, abrasion resistance, density, elastic recovery, delayed recovery, stretchability, flammability, heat resistance, ironing, heat yellowing, effects of extreme cold, resistance to attack by insects, fungi, and micro-organisms, resistance to marine deterioration, influence of light, moisture regain, shrinkage and swelling, water-extractable material, residual shrinkage (and the shrinkometer), and toxicological properties.

Comparison of certain yarn testing techniques, E. L. Phelps, H. M. Ward, D. Van Houten, and B. Bailey. (Minn. and S. Dak. Expt. Stas.). (*Rayon Textile Mo., 25 (1944), No. 3, pp. 63–65*).—This report presents the values for certain yarn properties obtained (1) by raveling the yarn sample as it is clamped in the testing machine, and (2) by raveling a replicate 12 hr. in advance of testing. The results obtained in application of the tests to cotton twill jeans, cotton suitings, and wool serges showed that the former method gave slightly higher values for yarn number than did the latter. The consistently higher values found for raveling at the time of test gave highly significant mean differences for twill jeans and suitings and argued against preraveling. In addition preraveling introduced problems in handling the yarn samples. There was also a tendency for yarn twist values to be slightly higher for yarns removed as they were fastened in the tester than for the preraveled yarns. The mean differences were either significant or highly significant for all fabrics tested, and argued against preraveling. For determinations of yarn number and yarn twist, removal of yarns from the fabric at the time of testing was considered superior. This method, however, did not give consistently or significantly superior results in determinations of yarn strength and yarn elongation. In a comparison of two methods for measuring the length of the sample for yarn number and yarn elongation, the twist tester proved to be no more desirable than the steel rule.

Shrinkage of rayon fabrics due to laundering pressed under controlled tensions, A. C. Gaston and H. M. Fletcher. (Kans. Expt. Sta.). (*Rayon Textile Mo., 25 (1944), No. 5, pp. 74–75, illus. 1*).—Fifteen fabrics, including continuous filament viscose, continuous filament cellulose acetate, and spun viscose material, were laundered under standardized conditions, rinsed, rolled in a towel, and allowed to stand at least 15 min. before pressing. The fabrics were laundered five successive times, and after each laundering shrinkage determinations were made with the tension presser (E. S. R., 87, p. 320) under tensions of 0, ½, 1, 3, and 4 lb.; they were wetted in distilled water after pressing under each tension. After pressing, the fabrics were conditioned in a standard atmosphere before measuring. The shrinkage data obtained showed that there was no difference in shrinking of the continuous filament viscose and continuous filament cellulose acetate rayon fabrics, but that the spun rayon fabrics shrank much more than those of continuous filament rayon. All materials shrank more in the warp than in the filling. Graphs showing the percentage shrinkage under different tensions indicated that differences in shrinkage due to successive launderings were negligible, and that tension decreased the shrinkage of the spun viscose rayon fabrics more than it did the shrinkage of other fabrics.

Shrinkage of cotton, linen, and rayon fabrics due to laundering, when pressed under controlled tensions, A. C. Gaston and H. M. Fletcher. (Kans. Expt. Sta.). (*Jour. Home Econ., 36 (1944), No. 8, pp. 516–520*).—Five fabrics each of cotton, linen, continuous filament viscose, continuous filament cellulose acetate, and spun viscose rayon—all of plain weave and none preshrunk or treated with finishes affecting shrinkage—were tested for shrinkage after each of five standard washings and pressings under controlled tensions. The shrinkage data, reported in detail, indicate that "shrinkage in cotton, linen, and rayon yard goods is considerably greater lengthwise than crosswise. Spun rayon shrinks much worse than do the continuous filament rayons, either of viscose or of acetate fibers. By gently stretching during the pressing of rayon fabrics made from continuous filaments, shrinkage can be eliminated; with spun rayons, pulling will reduce but not eliminate shrinkage." Findings concerning the rayons tested are essentially noted above.

Wearing qualities of viscose, cuprammonium, and acetate rayon hose, H. M. Fletcher. (Kans. Expt. Sta.). (*Rayon Textile Mo., 25 (1944), Nos. 2, pp. 66–67; 3, pp. 76–78, illus. 9*).—These three kinds of rayon hose were compared for their actual wear performance in tests similar to those previously carried out for silk and nylon hose (E. S. R., 88, p. 866). Fifty-four pairs of rayon hose, including 18 pr. and involving several brands of each kind, were worn by 15 different people in these tests. An extra pair of each brand was purchased and held as the unworn control for subsequent physical tests. Information on the price, shrinkage, and physical characteristics of the hose; the data on bursting strength of different parts of the hose; and data on hours of wear, indices of fading, and number of launderings are reported for all brands tested. The findings are summarized as follows:

"The viscose and cuprammonium were quite similar in performance. Because of the inherent properties of acetate, the acetate hose held their shape, fitted snugly around the ankle, and did not bag at the knee. These hose were somewhat more resistant to snagging than either the viscose or cuprammonium. However, holes were more readily worn in the acetate. The acetate hose did not wear as long as the viscose and cuprammonium. The viscose hose were worn an average of 330.60 hr., the cuprammonium 311.09 hr., and the acetate 194.24 hr. The statistical analysis showed that one kind of rayon hose was not significantly superior in wearing qualities. Considerable variability in the length of time worn was found for each kind of hose. The statistical analysis of the bursting strength data of the controls showed no significant differences among the three kinds of hose. In the worn hose there was no significant difference in bursting strength of the viscose and cuprammonium but each was greater than the acetate. The viscose and cuprammonium showed no significant differences in fading and each faded more than the acetate. The lesser fading of the acetate was probably due to the smaller number of launderings. The load-elongation characteristics of the yarns showed differences in their performance. All yarns of the different brands of viscose were nearly identical. The curves of the viscose and cuprammonium were similar to each other but unlike the acetate, which resembled the characteristics of wool yarn."

Carpet and rug repair, B. V. MORRISON and I. EKSTROM (*U. S. Dept. Agr., Farmers' Bul. 1960* (*1944*), *pp. 16, illus. 35*).—This bulletin, well illustrated to show the working details of the repairs described, covers the various types of damage resulting from wear on rugs. Equipment and materials are noted, and repairs for pile rugs and carpets, hooked rugs, and braided rugs are discussed.

HOME MANAGEMENT AND EQUIPMENT

Summary of family classification, cash cost of living, and farm privileges: By size and type of family groups, V. E. SCOTT and P. J. SWETT (*Farm Mangt. Bul.* [*Nevada Sta.*], *5* (*1944*), *No. 2, pp. 18+, illus. 3*).—In this summary, based on data collected in 1943, the farm families are classified, as in the previous survey (E. S. R., 90, p. 717), on the basis of family income rather than gross income. The average size of the 62 families in the study was 4.5 persons. On an average, net farm income accounted for 70 percent of the family income, nonfarm cash income for 12 percent, rent value of house for 6 percent, and farm produce used for 12 percent. Excluding expenditures for home investments (furnishings and improvements), the average cash cost of living for a family of 4.5 persons was $1,275, of which food amounted to $379. Cash food costs amounted to from 37–39 percent of the total cost of living expenses in groups of families averaging 4 and less persons and from 25–29 percent in families averaging more than 5 persons. Total annual food costs, including both cash and the farm value of home-produced foods, averaged about $488 for a family of 2, with an additional $155.50 for each additional person. Milk, eggs, and poultry provided by the farm constituted practically all of these three products used, but the other items of farm produce constituted only part of the produce used. Most of the cooperating families had gardens, and storage and canning were common.

In addition to food costs averaging $841 for the 62 families, the home expenses averaged $178 for clothing; $99 for home operation, including $53 for supplies and $46 for power, light, and phone; $152 for health; $267 for development and recreation; $79 for personal expenses; $93 for life insurance; and $28 for miscellaneous, making a total of $1,737. A tabulation of the living costs per family in the years 1940–43, inclusive, indicated little change in living costs in this 4-yr. period.

REPORTS AND PROCEEDINGS

Postwar agricultural policy: Report of the Committee on Postwar Agricultural Policy of the Association of Land-Grant Colleges and Universities (*Assoc. Land-Grant Cols. and Univs., 1944, pp. 61+*).—This report of the association's special committee on post-war agricultural policy, presented at the 1944 meeting (E. S. R., 92, p. 159), is stated to have been prepared "with the purpose of advancing the welfare of all the people of this Nation by making constructive suggestions for a sound agricultural policy." The various sections deal with agriculture and the national welfare; adjustments in agricultural production; agricultural prices; land tenure; conservation of land, water, and forests; rural living and social facilities; and the role of farm people in policy making.

Greater production through research: Fifty-fifth Annual Report [of the Arkansas Station, 1943], C. O. BRANNEN (*Arkansas Sta. Bul. 443 (1944), pp. 39, illus. 1*).—In addition to projects reported upon elsewhere in this issue, this report notes progress on an experimental rice drier; improving swine by inbreeding and selection; field crop practices, including pasture development on abandoned land, oat, wheat, barley, rye, cotton, peanut, soybean, and potato varieties; ammonium nitrate as a source of nitrogen; rice fertilization; hybrid corn; dehydration of vegetables; daily picking of cucumbers for pickles; variety, spacing, and thinning tests with sweet corn; and control of codling moth, moles, the lesser cornstalk borer, and rats.

Report of branch experiment stations, C. W. HUNGERFORD ET AL. (*Idaho Sta. Cir. 94 (1944), pp. 16, illus. 4*).—Brief reports are given on work in progress, including supplemental feeding of lambs on pasture and the use of protein supplements; relative feeding value of corn silage, beet top silage, and wet beet pulp; preparation of beet top silage; steer fattening trials; value of heavy rates of phosphorus fertilization; sweetclover to build up soil fertility; variety tests with oats, barley, and potatoes; corn hybrids; grass and pasture studies; handling of seed potatoes and seed spacing; jelly-end rot of potatoes; second growth of potatoes and hastening of tuber maturity; potato storage; dwarf smut of wheat; rotations; and stubble-mulch farming.

Science for the farmer: Fifty-seventh Annual Report of the Pennsylvania Agricultural Experiment Station [1944], [F. F. LININGER] (*Pennsylvania Sta. Bul. 464 (1944), pp. 40+, illus. 12*).—In addition to progress reports abstracted elsewhere in this issue, notes are given on work in agricultural engineering, including domestic food-freezing units and carburetor adjustments; apiculture, including top entrances to hives and liberal sugar feeding of bees; dairy production, including prepartum milking of cows as an aid in mastitis control, Ladino clover in hay mixtures, mixed silages, and heavily wilted grasses and legumes for silage; dairy manufacturing, including milk powder of low lecithin content, stabilization of butter by heating, vitamin C-enriched milk, and sampling of homogenized milk; farm crops, including Kentucky bluegrass straws, soybean varieties, potato rotations and sprays, and blight-immune potatoes; forestry, including peeling of bark by "bug-peeling," and strength of laminated beams; livestock, including hothouse lamb production, vitamin B and "sulfa" drugs for weanling pigs, vegetable proteins for pigs, and "sulfa" drugs for calves; nutrition, including pork thiamine values, effect of fat on utilization of food energy, usefulness of dynamic effect of food, and improved vitamin assay methods; orcharding, including hardiness of peach buds, ringing of filler apple trees, cover crops, fertilizer for peaches, fine grinding of sulfur, control of curculio on peaches, newer sprays for apples and peaches, purple-banded leafroller and white-spotted apple budworm as pests of apples, cherry fruit-fly control with cryolite spray, leafhopper injury of grapes, and spray residues on grapes; poultry husbandry, including livability of poultry, grain and mash feeding of baby chicks, vegetable protein in rations, golf green clippings for turkeys, sanitation for turkey poults, and "sulfa" drugs for chickens; soil fertility, including mulches for soil moisture control, germination injury by excess fertilizer salts, management of Volusia soils, clostridia, and soil nitrogen; and vegetable and flower growing, including irrigation, varieties, fertilizers, rust resistance in antirrhinums, insecticides, aerosol bombs for mushroom horseflies, relation of damping-off to soil moisture, and spring planting of roses.

Wartime agricultural research: Fifty-sixth Annual Report [of Rhode Island Station, 1943], M. H. Campbell (*Rhode Island Sta. Rpt. [1943], pp. 46*).—In addition to projects reported on elsewhere in this issue, progress reports are given of work with field crops, including the use of extra potash for grass-legume hay, corn varieties, disease resistance in bentgrasses, pasture renovation, grasses for airports and fairways, killing weed seeds in composts, and control of crabgrass; vegetables, including tomato hybrids, spacing of peas, cover crops, variety tests, and rot reduction; fruit, including apple scab control, new fungicides, apple fruit disinfection, and poison residue removal, the spray program and tree growth, storage losses, and effect of waxing on Jonathan spot disease; potatoes, including culture, varieties, cover crops, fertilizers, seed treatment, and pest control; foods, including freezing, dehydration, vitamin losses, and the use of milk, table fats, and fruits and vegetables; poultry proteins, including condensed buttermilk, a mixture of cereal grasses and condensed milk, dried yeast, and alfalfa meal; egg yolk as a medium for the growth of infectious coryza organisms; fuel substitutes for use in brooder stoves; rural economics, including food and hay production possibilities, and the Newport and Providence milk supply; and meteorological data.

Report of the Chief of the Agricultural Adjustment Agency, 1944, N. E. Dodd (*U. S. Dept. Agr., Agr. Adjust. Agency Rpt., 1944, pp. 45+*).—This report to the War Food Administrator for the fiscal year ended June 30, 1944, describes the activities of county committeemen and the results accomplished. Statistics and financial tables are included.

Report of the President of the Commodity Credit Corporation, 1944, J. B. Hutson (*U. S. Dept. Agr., Commod. Credit Corp. Rpt., 1944, pp. 16*).—The annual report to the Administrator, War Food Administration.

Annual report of the Inter-American Institute of Agricultural Sciences: Fiscal year 1943–44 (*Inter-Amer. Inst. Agr. Sci. Ann. Rpt. 1943–44, pp. 90+, illus. 32*).—This is the second annual report of the institute, covering the fiscal year ended June 30, 1944.

MISCELLANEOUS

On the aims and methods of biological history and biography, F. Verdoorn (*Chron. Bot., 8 (1944), No. 4, pp. 427–448, illus. 2*).—The author discusses various methods of procedure in the preparation of historical material in biology and its biography, with special reference to plans for the Index Botanicorum.

Science in the university (*Berkeley and Los Angeles: Univ. Calif. Press, 1944, pp. 332+, illus. 55*).—Among the chapters in this volume, the following are included: What Makes the Barometric Pressure Rise or Fall? by J. Bjerknes (pp. 81–95); A Modern Conception of Living Material, by O. L. Sponsler (pp. 159–181); On Some Facts Pertinent to the Theory of the Gene, by R. B. Goldschmidt (pp. 183–

210); Longevity in Organisms, by C. P. Lipman (pp. 211–230); The Study of the Sea and Its Relation to Man, by C. E. ZoBell (pp. 231–245); Trees and History, by R. W. Chaney (pp. 247–265); General Aspects of the Study of Plant Nutrition, by D. R. Hoagland (pp. 279–292); and Physiology as an Independent Science, by J. M. D. Olmsted (pp. 293–303).

Patent manual for employees of the United States Department of Agriculture, 1944 (*U. S. Dept. Agr., Misc. Pub. 551* (*1944*), *pp. 41+, illus. 1*).—A manual prepared by a committee composed of representatives of the Solicitor's Office and the research bureaus. It is not a complete text on patent law but outlines the patent policy of the Department, the "high lights" of patent law, and the Department's patent procedure. Appendix includes form for the assignment of a patent to the Department, the Department regulations and memoranda concerning patents, the patent laws affecting Government employees, the rules of practice in the United States Patent Office frequently referred to in Departmental communications, and examples of specifications.

Michigan Agricultural Experiment Station Quarterly Bulletin [August 1944], edited by J. G. DUNCAN (*Michigan Sta. Quart. Bul.*, *27* (*1944*), *No. 1, pp. 157+, illus. 60*).—In addition to many articles noted elsewhere in this issue, this number contains Color and Palatability of Cooked Jonathan Apples, by R. M. Griswold (pp. 60–62); and Notes on Dairy Cleaners and Cleaning Dairy Equipment (pp. 109–111), and Notes on the Sanitization of Dairy Equipment (pp. 112–115), both by W. L. Mallmann.

Mississippi Farm Research, [October 1944] (*Miss. Farm Res.* [*Mississippi Sta.*], *7* (*1944*), *No. 10, pp. 8, illus. 6*).—In addition to articles noted elsewhere in this issue and meteorological notes for September, this number contains Livestock Marketing by Mississippi Producers, by D. W. Parvin (pp. 1, 8); Most Farm Prices Show Slight Increase, by D. G. Miley (pp. 1, 2); Tung Culture in Mississippi, by S. R. Greer and T. E. Ashley (pp. 3–6, 7), also to be issued as a station bulletin; and One Bushel Increase in Oat Yield for Each Pound Actual Nitrogen Applied, Shown in 17-Year Test at Stoneville, by J. Pitner (p. 8).

Agricultural experiment station publications (*Louisiana Sta. Cir. 35* (*1945*), *pp.* [*8*]).—This circular classifies the available publications of the station by subjects.

List of research bulletins (*Wisconsin Sta. Spec. Bul., 1944, June, pp.* [*5*]).—This list includes available research bulletins in agricultural economics, agronomy, animal husbandry, dairy manufacturing, economic entomology, forestry, horticulture, rural sociology, and soils.

Boletin bibliografico (*Argentina Min. Agr., Bol. Bibliog., Apr.–June, 1944, pp. 27*).—This is a list, classified by subjects, of the agricultural science and related material available in the library of the Argentine Ministry of Agriculture.

NOTES.

Arkansas University and Station.—Dr. R. P. Bartholomew has been appointed associate director. Leland W. Plunkett has resigned as assistant agricultural editor and has been succeeded by Emmett J. Lee, Jr.

Colorado College and Station.—Dr. Lawrence W. Durrell, head of the department of botany and plant pathology, has been appointed dean of the science division, effective July 1. Junius L. Forsberg, assistant professor of plant pathology and plant pathologist, has been appointed research pathologist for the Illinois Natural History Survey.

Kentucky University and Station.—The resignations are noted of Dr. J. D. Turner as assistant veterinarian and James J. Rose as microscopist in the Feed and Fertilizer Control. Ernest D. Wightman has been appointed assistant professor of poultry husbandry and assistant in poultry in the station, and Charlotte Baugh, seed analyst.

Missouri University and Station.—The station has acquired an 80-acre farm to be used entirely for research on poultry, and it is planned to start some experimental work this summer. Pending modification of the building restrictions, the farm will be used for research on turkey production, chick feeding experiments, and studies involving getting a pullet ready for transfer to the laying house. The small poultry farm previously in use will be devoted entirely to studies with adult birds.

A monthly publication, *The Announcer,* has been begun primarily for distribution to farmers. This will contain abstracts of the new bulletins, announce short courses and agricultural meetings to be held locally, and include other items relating to the college and station.

The station is installing a small experimental frozen food locker plant and plans to begin experimental work around May 1.

Dr. H. M. Haag, associate professor of agricultural economics and in charge of price and marketing research, has resigned to become economic adviser for the Missouri Farmers Association.

Montana College and Station.—J. Leroy Van Horn, assistant professor of animal husbandry and wool technologist, has resigned to accept a position as wool marketing specialist with the U. S. D. A. Farm Credit Administration.

Rutgers University and New Jersey Stations.—Dr. William S. Myers, assistant chemist in 1888–89 and instructor and associate professor in chemistry from 1893–1901 and widely known as director of the Chilean Nitrate Commission for the United States during the ensuing quarter century, died January 10. He was born in Albany, N. Y., in 1866 and received from Rutgers the B.S. degree in 1889, M.S. in 1894, and D.Sc. in 1908. He was much interested in the development of the institution, as well as of many other civic enterprises, and served as a member of the university board of trustees for many years.

Cornell University and Station.—Dr. Delmar S. Fink, assistant professor of agronomy, has resigned to engage in commercial work.

New York State Station.—Plans and specifications are being prepared for a food-processing building to cost about $540,000 and constitute the first unit of a post-war building project approved by the State Post-War Planning Commission.

Dr. R. G. Rice has been appointed investigator of corn products for work on the proteins of the corn grain.

Utah College and Station.—James A. Bennett, associated with the range livestock investigations at the Swift Current (Saskatchewan) Substation, has been appointed assistant professor of animal husbandry vice Dr. I. F. Edwards, resigned to engage in farming in Iowa.

Virginia Station.—The station has undertaken a project on the economic classification of land, supported by State funds. The following personnel has been appointed: G. W. Patteson, soils specialist, and F. V. Shelton, A. J. Harris, J. A. McCartney, and S. C. Shull, as land classifiers. Other recent appointments include Dr. M. J. Janes as assistant entomologist vice J. A. Cox, and Dr. M. C. Wilson, Jr., and T. M. Starling as assistant agronomists (plant breeding).

Wisconsin University and Station.—Additional gifts (E. S. R., 92, p. 158), totaling nearly $26,400, have been accepted by the Board of Regents. Among these are $5,200 for an industrial fellowship in biochemistry to study the vitamin and amino acid content and nutritional value of meats; $3,300 for studies of the inactivation of milk by ultraviolet light; $3,300 for the utilization of waste sulfite liquor from paper mills; $1,600 on the effects of processing on meats and meat products; $2,200 on factors affecting the activity of dried brewers' yeast; $500, the improvement of hemp fiber; $2,000, relationships between the nicotinic acid content of milk and its antipellagra qualities; and $200 to determine the suitability of milorganite and other sewage products as constituents of mushroom composts.

Wyoming University and Station.—Mack O. North, associate professor of animal production and assistant poultry husbandman, has resigned to accept a commercial position in St. Louis and has been succeeded by Dr. Lawrence Morris.

U. S. Department of Agriculture.—Dr. Samuel L. Jodidi, biochemist and plant physiologist in the Bureau of Plant Industry from 1913 until his retirement in 1937, died December 31, 1944, at the age of 77 years. A native of Russia and a recipient of the Ph.D. degree from the University of Giessen in 1894, he had also served as research chemist in the Michigan College and Station in 1908–9 and from 1909–13 was in charge of soil research in the Iowa Station.

Grants by the Nutrition Foundation.—Since the organization of this foundation in 1941, contributions have been received from 50 food and related manufacturers of $1,524,500. The foundation has made appropriations totaling $654,700 to support 95 research projects in American universities.

Among the grants recently approved are $5,600 to Harvard University for research in community nutrition; $1,800 to the University of Chicago on the iron requirements of the adolescent girl; $5,000 to the University of Southern California on the intermediary metabolism of carotene; and $850 to Meharry Medical College for studies on pantothenic acid. Renewals of earlier grants were made on 14 studies, among them $1,500 to Cornell University for the quantitative study of the nutrients of cow's milk; $2,000 to the University of California on the relation of niacin and B-vitamin deficiencies to oral diseases, and $9,000 to the same institution for the microbiological analysis of amino acids; $6,800 to the Rockefeller Institute for the concentration of new vitamins; $7,500 to Vanderbilt University on the absorption of iron compounds in anemia; and $15,000 to Columbia University for studies on carbohydrate metabolism.

American Phytopathological Society.—The thirty-sixth annual meeting of this society was held in Cincinnati, Ohio, December 9–11, 1944, with approximately 300 members in attendance. About 80 papers were presented involving original research, arranged in sections of fungicides, virus and bacterial diseases, disease resistance, seed and soil treatments, and factors affecting disease development and fungus diseases. There were also several conferences dealing with the activities of the war committee, new developments in fungicides, plant disease surveys, breeding for disease resistance, the phloem necrosis disease of elm, and seed treatment research. The officers elected included Dr. H. B. Humphrey, president; Dr. J. H. Craigie, vice president; E. M. Johnson, Lexington, Ky., secretary; and Dr. R. M. Caldwell, treasurer.

American Association of Economic Entomologists.—The fifty-sixth annual meeting of this association, held jointly with the thirty-ninth annual meeting of the Entomological Society of America, took place in New York City December 13–15, 1944, with a registration of about 350 and a considerably larger attendance. One entire session was devoted to post-war planning, and nearly a day and a half to papers and discussions on the use of DDT as an insecticide. D. L. Van Dine was elected president; T. H. Frison, vice president; and E. N. Cory, College Park, Md., secretary-treasurer.

Extension Institute on Post-war Programs.—The thirtieth annual extension conference of the Cooperative Extension Service, U. S. Department of Agriculture, was held in Washington, D. C., from January 4–6 and dealt with the educational aspects of plans and policies of national farm, labor, business, welfare, and religious organizations in connection with winning the war and the transition and post-war periods, and the educational problems, plans, and programs for the post-war period. Following an address by Secretary of Agriculture Claude R. Wickard, read by Assistant Secretary Charles F. Brannan and entitled Agriculture During the War and After the War From the Standpoint of General Education and Citizen Understanding, a report made by the committee on post-war agricultural policy of the Association of Land-Grant Colleges and Universities, noted on page 459 of this issue, was discussed by its chairman, Assistant Director Noble Clark of the Wisconsin Experiment Station. Papers and addresses followed by representatives of many other organizations and groups, including the Committee for Economic Development, the U. S. Chamber of Commerce, the Congress of Industrial Organizations, the American Federation of Labor, the Railway Labor Executives' Association, the National Planning Association, the Producers' Council of Manufacturers of Building Products, the Federal Council of Churches of Christ, the National Catholic Welfare Conference, the National Cooperative Council, the Farmers' Educational and Cooperative Union, the American Farm Bureau Federation, the Cooperative League of the U. S. A., the National Grange, the National Cooperative Milk Producers' Federation, the American Institute of Cooperation, the State Department, the U. S. D. A. Bureau of Agricultural Economics and Extension Service, the Federal Office of Education, the National Education Association, the American Vocational Association, the extension services of the Pennsylvania State College and Ohio State University, the Committee on Education of the U. S. House of Representatives, the American Council of Education, and others.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The use of the mixogram in evaluating quality in soft wheat varieties, V. H. Morris, C. E. Bode, and H. K. Heizer. (U. S. D. A. coop. Ohio Expt. Sta.). (*Cereal Chem., 21 (1944), No. 1, pp. 49–57, illus. 3*).—A procedure found satisfactory for obtaining recording mixer curves from soft wheat flours for characterizing variety samples over the entire range in flour strength found among samples grown in the eastern soft wheat area is described. A single-figure score obtained by measuring the area under the flour mixer curve for a mixing time of 7 min. is suggested as a general expression of strength due to gluten quality and quantity.

In a test of 29 varieties representing a wide range in quality, ranking according to mixer curve area was consistent with what is known regarding the relative quality of the varieties. High correlation coefficients between the measured areas and the results of such other quality tests as 20-gm. flour viscosity and cookie and bread baking were obtained. Since varietal quality characteristics as expressed in mixer curves are modified greatly by environment, comparative evaluation of soft wheat varieties by such curves can be made only on samples grown under uniform conditions.

Sifted wheat meal mixograms for selecting soft wheat varieties, C. A. Lamb. (Ohio Expt. Sta.). (*Cereal Chem., 21 (1944), No. 1, pp. 57–64, illus. 2*).—The authors developed technics for preparing sifted wheat meal from soft wheats, and for making sifted wheat meal mixer curves. The meal required to be finely ground and the temperature at which the mixograms are made had to be controlled carefully. Wheat was tempered to approximately 16 percent before grinding. The area under the wheat meal mixer curve (6 min.), adopted as the quality measure, was found highly correlated with flour mixer curve area and with other quality tests, such 20-gm. flour viscosity. The test is simple and rapid and can be satisfactorily carried out with 125 gm. of wheat.

Results reported include data from the Federal uniform soft wheat nursery composites (30 varieties, 2 seasons) and from Ohio wheat breeding nurseries (25 strains, 5 locations, 2 seasons).

Varietal, station, and seasonal effects upon some properties of mixograms made from hard red spring wheat flours by various mixing methods, R. H. Harris, L. D. Sibbitt, and M. Elledge. (N. Dak. Expt. Sta.). (*Cereal Chem.,*

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[1] The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).

21 (1944), No. 1, pp. 38–48, illus. 3).—Dough development stage, range of dough stability, and curve height showed significant differences among eight varieties grown at four locations in 1942. There were highly significant differences between mixing methods. For six varieties grown at four stations for 2 yr., significant differences between years were found only for curve height. In this series, very significant differences were found between varieties for dough development stage and range of stability. Varietal mixing characteristics were reasonably consistent for the two crop years. Throughout the experiments reported, station differences in dough development stage and curve height were highly significant. Mixer tracings obtained from blends of gluten and starch showed that varietal differentiation in mixing properties is related to the gluten and not to the starch component. Fermentation did not change the relations between corresponding mixing properties. Doughs having a long development stage tended to have a greater range of stability. Several of the wheats examined differed significantly in curve properties from varieties that have been accepted as satisfactory by the milling industry.

Factors which influence the physical properties of dough.—VI, Effect of cysteine and some other substances on mixogram patterns, C. O. Swanson and A. C. Andrews. (Kans. Expt. Sta.). (*Cereal Chem. 21 (1944), No. 2, pp. 140–149, illus. 4*).—Continuing this series (E.S.R., 92, p. 168), cysteine decreased the time required to reach minimum mobility, while a commercial brand of sodium dioctylsulfosuccinate had the opposite effect. By suitable quantities of these reagents, the time factor may be adjusted. Other substances containing thiol groups, such as hydrogen sulfide, ethyl mercaptan, and isopropyl mercaptan, influenced the mixer pattern in a manner similar to that in which cysteine acted. This is believed to indicate that the thiol group in cysteine is the main cause of its action on dough.

Sodium chloride has a stiffening effect on the dough, an action which persisted in the presence of cysteine. This stiffening effect was much reduced by increasing the water by 1.5 cc. for each 0.35 gm. of sodium chloride added.

Neither cysteine nor sodium dioctylsulfosuccinate, in the quantities used, had any deleterious effects on loaf volume or texture.

The effect of some wetting and reducing agents on the mixing time and on the quality of bread, C. O. Swanson and J. A. Johnson. (Kans. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 3, pp. 222–232, illus. 2*).—The results obtained with an MPB (malt-phosphate-bromate) formula were different from those obtained with a richer formula, showing that the constitutents in the formulas had an influence on the action of the agents used. Sodium lauryl sulfate showed effects less desirable than those of sodium dioctylsulfosuccinate. With the MPB formula, sodium dioctlysulfosuccinate made the dough of Tenmarq bucky, whereas Chiefkan became puttylike. Cysteine with the MPB formula and with a greatly reduced mixing time produced doughs with very good handling properties and improved bread for Tenmarq. With Chiefkan, cysteine made the doughs soft and produced no improvement in the bread. The effects of boiled yeast extract and H_2S-saturated water were similar to those from cysteine. Potassium bromate, used only with the rich formula, had small or inconsequential effects. Increasing quantities of potassium bromate did not correct the harmful effects of the larger amounts of cysteine on Chiefkan.

The proportions in which these various agents were used proved critical. When beneficial results were obtained with small amounts, larger quantities often produced harmful effects. Superior results were obtained by using the mixing time which coincided with the point of minimum mobility as affected by the various agents added. The results for this optimum mixing time were consistently better than for the constant mixing time as established by the checks.

In general, Tenmarq was more favorably responsive to these treatments than Chiefkan. No treatments made the characteristics of Chiefkan similar to those of an untreated Tenmarq. Making the mixing time of Tenmarq shorter was beneficial, while shorter mixing time for Chiefkan had deleterious effects. Increasing the mixing time of Chiefkan produced a slight improvement in the bread.

The inhibitory effect of a protamine from wheat flour on the fermentation of wheat mashes, A. K. BALLS and T. H. HARRIS. (U. S. D. A.). (*Cereal Chem., 21 (1944), No. 1, pp. 74–79*).—In the fermentation of whole-wheat meal, a fermentation inhibitor found in wheat appears to be either neutralized or in some manner destroyed by other substances that must occur in the bran. In the fermentation of granular flour, the toxic substance was found to be present and active. It may be destroyed by proteolysis or by pressure cooking, or partly destroyed by heating to 100° C. for 1 hr., but it is very little affected by a cooking temperature of 80° for 1 hr.

Effects on flour doughs of extracts from unfermented and fermented wheat germ, R. STERN (*Cereal Chem., 21 (1944), No. 2, pp. 81–97*).—The distribution of soluble and protein thiol groups in heated and unheated extracts from unfermented and fermented wheat germ was investigated.

The soluble thiol groups were found to be the cause of the injurious effect of wheat germ extract on dough. Fermentation of wheat germ decreased its content of soluble and protein thiol groups. Extracts from unfermented wheat germ, added to unsalted dough, caused serious gluten disintegration on washing. Dough fermentation increased the gluten disintegration in the blank doughs as well as in those containing germ extracts. There was a decrease of soluble nitrogen in doughs containing extracts from unfermented germ. Dough fermentation decreased the cystine content in the gluten, but thiol groups did not significantly affect it.

Aging of flour and maturing of dough is assumed to be connected with the oxidation of the thiol groups of germ particles contained in the flour. This oxidation in stored flour and fermenting dough is attributed to dehydrogenases. Their presence in wheat germ is demonstrated.

Flour blends and the question of complementary effects, K. F. FINNEY and M. A. BARMORE. (Kans. Expt. Sta. coop. U. S. D. A. and State expt. stas.). (*Cereal Chem., 21 (1944), No. 1, pp. 65–74, illus. 4*).—Flours of one hard spring and five hard winter varieties having widely different properties and varying in protein content from 14.6 to 15.7 percent were blended in various proportions with (1) a low-protein, good-quality soft red winter wheat flour; (2) a medium-protein, poor-quality hard red winter flour; and (3) a medium-protein, good-quality, hard red winter flour. The individual flours and their blends were baked into bread and the results compared.

The loaf volumes and bread color scores gave no evidence of complementary effects. Both qualities were found to be directly proportional to the amount of each flour in the blend. The grain scores likewise indicated no complementary effects, allowance being made for the type of grain normally found in bread from high-protein flours. Complementary effects appeared to be due largely to the methods used in the baking test. In the work reported herein, the absorptions, mixing times, bromate levels, etc., are held to have been such that the potentialities of each variety were probably sufficiently expressed. Under such conditions there is considered to be probably less opportunity for complementary effects than there would otherwise be. It is believed, therefore, that the carrying power of a flour is a function of protein quality and quantity, and can be measured by the loaf volume obtained with the rich, highly bromated, milk-containing formula.

The sulfhydryl groups of wheat flour, H. S. MYERS and E. B. WORKING (*Cereal Chem., 21 (1944), No. 1, pp. 32–37, illus. 1*).—The authors found no indications of the presence of either reactive or unreactive thiol groups in the gluten proteins. There appeared to be no free thiol groups in the soluble protein fraction of flour, but there were definite indications of the presence of unreactive thiol groups which were liberated on denaturation of these soluble proteins. The presence of free thiol groups in the liquid fraction, first demonstrated by Balls and Hale,[1] was confirmed.

The action of oxidizing agents on sulfhydryl compounds in dough, J. C. Baker, H. K. Parker, and M. D. Mize (*Cereal Chem., 21 (1944), No. 2, pp. 97–107*).—In refined flours of widely varying strength, the thiol values per gram protein ranged from 0.73 to 1.22 mg. for aqueous extracts, from 0.12 to 0.22 mg. for hand-washed glutens, and from 0.05 to 0.13 mg. for purified glutens. No consistent relationship between the thiol content of the three flour fractions of various flours or between their thiol content and gluten strength was found. A large fraction of the thiol in the glutens could not be removed by repeated washings. Since added glutathione may be readily washed out, a considerable proportion of the thiol groups of flour is believed probably to be present in more complex cysteine combinations. These thiol compounds do not appear to be an integral part of the molecular structure of the gluten proteins, since the thiol content of the purified glutens varied widely. The thiol compounds probably are of many compositions and include glutathione, a fat-soluble sulfur-bearing compound, and other compounds of more complex structure more strongly absorbed by the flour proteins.

Treatment of flour with chlorine and nitrogen trichloride, mixing doughs in oxygen or with sodium chlorite, fermenting doughs with or without bromate, and natural aging of flour lowered the thiol content of water extracts and glutens prepared therefrom. The total decrease in thiol which resulted from the flour treatments was equivalent to approximately 100 p. p. m. glutathione, a quantity which is sufficient to produce marked effects in bread making. Changes in gluten strength did not parallel the reductions in thiol content due to oxidation. The effects of thiol compounds upon the baking properties of flour may be due to properties similar to the peptizing action of cysteine but of a much milder nature.

Effect of hydrocyanic acid on the baking quality of flour, H. D. Young and E. G. Bayfield. (U. S. D. A. and Kans. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 2, pp. 149–154, illus. 4*).—Hydrocyanic acid when used as a flour fumigant produced an appreciable and detrimental influence upon the bread baking quality. This effect disappeared, however, after thorough aeration of the flour. Ginger cake made from freshly fumigated flour was free of fumigant.

Rapid estimation of peroxidase in vegetable extracts—an index of blanching adequacy for frozen vegetables, M. P. Masure and H. Campbell. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 12, pp. 369–374, 383, illus. 1*).—The method, described in detail as to procedure and reagents, is based upon a periodic measurement of the rate of color development in a guaiacol-hydrogen peroxide substrate under the catalytic influence of the enzyme present in the tissue extract. Values obtained by the method on extracts of asparagus, snap beans, soybeans, corn, parsnips, peas, cabbage, spinach, and tomatoes showed definite correlation with degree of blanching and quality retention in stored vegetables preserved by freezing. The method, modified to dispense with the blender for preparing the tissue extract and with a colorimeter for measuring the color development, provided a simpler semiquantitative test for plant use. Thus modified the method was sufficiently accurate to give good correlation with quality retention in a number of frozen vegetables. It is considered satisfactory for determining adequacy of blanching and predicting the probable storage life of frozen vegetables.

Effect of Seitz filtration upon pH, H. B. Webb, O. J. Irish and V. I. Lyday (*Jour. Bact., 48 (1944), No. 4, pp. 429–437, illus. 4*).—Washings from Seitz filters became more alkaline; it is not possible to say from these findings that the alkalinity was due to the presence of Mg compounds alone. The titration curves of filtrates and the filter pads themselves indicated the presence of a weak base or a buffer substance with a basic pH. It is recommended that standards of processing be established which will insure the manufacture of filter pads more nearly neutral in reaction.

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[1] Cereal Chem., 17 (1940), No. 2, pp. 243–245.

Zur methodik der bestimmung von gesamtvitamin C [A method for the determination of total vitamin C], E. GÜNTHER (*Biochem. Ztschr., 314 (1943), No. 5–6, pp. 277–284, illus. 2*).—In this method the reduction of dehydroascorbic acid is accomplished with nascent hydrogen as evolved in the process of electrolysis. The simple apparatus described and illustrated consists of a clay cell of 8 cm. height and 25 cc. capacity set within a beaker of similar height; 10 cc. of the extract to be analyzed is placed within the cell, and outside within the beaker 2-percent metaphosphoric acid is added to the same depth as the extract. A platinum wire serving as the cathode is immersed in the extract within the cell and two long, thin strips of platinum as anodes are immersed in the metaphosphoric acid in the beaker. The electrodes are sealed into glass tubes which are partly filled with mercury through which contact is made with the wire leads from a storage battery of 4–6-v. potential. A 10-min. period of electrolysis with this voltage and a current of 7 ma. was found satisfactory. An 8-v. potential was less desirable because it caused foaming. If the glass tube holding the electrodes are inserted in a large cork or rubber stopper, the ensemble may be readily moved from cell to cell; and if several electrode sets are connected in parallel a large number of reductions can be carried out simultaneously. Following the reduction, total ascorbic acid in the extract is determined by titration with 0.001 N 2,6-dichlorophenolindophenol solution.

Extracts of the several vegetables analyzed were prepared by grinding 10 gm. of the finely cut material in a mortar for 10 min. with 5 gm. of pure fine sand and 10 cc. of 1-percent HCl. From this material, transferred to a centrifuge tube with one washing of 10 cc. of 2-percent metaphosphoric acid, the solid material was removed by centrifuging for 3 min. at 3,000 r. p. m. The supernatant liquid was transferred to a 100-cc. graduated flask, with two washings of 20 cc. of 2-percent metaphosphoric acid, and made up to volume with metaphosphoric acid; 10 cc. of this extract, corresponding to 1 gm. of substance, was used for ascorbic acid determination. Direct titration without reduction gave a measure of the reduced ascorbic acid, while titration after reduction gave a measure of the total ascorbic acid. The use of hydrochloric acid in preparing the extract destroyed any enzymes present and broke down any protein-ascorbic acid complexes in the material. Elimination of the hydrochloric acid, therefore, and extraction with metaphosphoric acid only, gave an extract which upon titration showed only the amount of free ascorbic acid present in the substance.

A color reaction of ascorbic acid with nicotinamide and nicotinic acid, T. H. MILHORAT (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, p. 52*).—A mixture of ascorbic acid and nicotinamide, when moistened with water and stirred into a thick paste, produced a canary yellow color which was best observed when the test was carried out on a spot plate. Nicotinic acid gave a similar color reaction with ascorbic acid, although the reaction proceeded more slowly.

A color reaction of ascorbic acid with derivatives of pyridine, piperidine, quinoline, and isoquinoline, A. T. MILHORAT (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 52–55, illus. 2*).—This investigation showed that many pyridine derivatives other than nicotinamide and nicotinic acid reacted with ascorbic acid to give a yellow color. While the reaction could be observed in solution, the simplest and most satisfactory method was to moisten the mixture on a spot plate and stir it into a paste. Among the large number of substances tested, there were many which gave no color reaction. In general, the color reaction occurred with compounds in which the alpha-carbon of the pyridine ring was not occupied by a radical other than the methyl group. These conditions also held with the piperidines, quinolines, and isoquinolines investigated. The effect on the reaction of radicals attached to the nitrogen atom and the influence of neutralization of the carboxyl group in the alpha position are discussed.

The isolation of nicotinic acid from milk and its role as an essential growth factor for Acetobacter suboxydans, J. V. Karabinos and D. M. Dicken (*Arch. Biochem., 4 (1944), No. 2, pp. 211–215, illus. 1*).—Methyl nicotinate mercuric chloride was prepared from a crude biotin concentrate from milk containing 0.3–0.5 percent nicotinic acid by a process involving esterification with acidic methanol, following which the crude ester was neutralized, taken up in ethyl acetate, freed of solvent in vacuo, and then dissolved in chloroform. This solution was further purified by passing it through a column of Decalso for removal of the biotin, according to the method of Melville et al. (E. S. R., 87, p. 625). The chloroform eluate was concentrated in vacuo, the residue distilled at 0.1-mm. pressure, and the distillate extracted with three successive portions of 2-percent hydrochloric acid. The extracts, when adjusted to pH 6.5 and treated with a 10-percent solution of potassium mercuric chloride, yielded upon standing fine white needles of the methyl nicotinate mercuric chloride; these were separated by filtration and recrystallized from methanol. A mixed melting point of (189°–190° C.) of this compound with the one synthesized from nicotinic acid showed no depression. Nicotinic acid was obtained from the isolated compound by successive treatments with sodium hydroxide, copper acetate, and hydrogen sulfide; the filtrate obtained after filtering off the copper sulfide was concentrated to dryness in vacuo and the residue sublimed at 0.1 mm. to give a sublimate which when mixed with an authentic sample of nicotinic acid gave no depression of the melting point. The assay procedure used to determine the activity of the biotin concentrates employed was based on the growth response of *A. suboxydans* to nicotinic acid in the simplified basal medium of Underkofler et al. (E. S. R., 89, p. 185).

"Since the growth was proportional to the amount of nicotinic acid present, the nicotinic acid content of the sample was calculated by comparison with the growth obtained in a standard. The accurate portion of the standard curve ranged from 0.25γ to 3.0γ of nicotinic acid. Nicotinic acid and the amide were equally effective in stimulating the growth of *A. suboxydans.*"

A method for the estimation of nicotinamide methochloride in urine, R. A. Coulson, P. Ellinger, and M. Holden (*Biochem. Jour., 38 (1944), No. 2, pp. 150–154, illus. 2*).—Nicotinamide methochloride, a metabolite of nicotinamide and nonfluorescent until treated with alkali and transferred to isobutanol, was estimated in urine by a method which involved adsorption on Decalso, elution with KCl, and conversion to the fluorescent form. The fluorescence produced was compared with that of standards similarly treated.

Quenching effect of electrolytes on the fluorescence intensity of riboflavin and thiochrome, P. Ellinger and M. Holden (*Biochem. Jour., 38 (1944), No. 2, pp. 147–150, illus. 1*).—In aqueous solution considerable quenching effect on riboflavin fluorescence was observed with ferrous and ferric salts and, among the anions, with halides, cyanide, thiocyanide, sulfite, and nitrite. With an aqueous solution of thiochrome considerable quenching occurred only with halides, nitrite, ferricyanide, lactate, ammonium salts, and iron salts; the fluorides and iodides had a much higher quenching effect than chlorides and bromides. The quenching effect in isobutanol solutions was influenced by the absolute and relative solubilities of the quenching compounds in water and isobutanol. In saturated isobutanol solution it was higher for most substances than in aqueous solution. Maximum fluorescence was exhibited by riboflavin in the pH range 5.9–7.7 and by thiochrome at the alkaline end of the range examined (pH 11).

Thiamine determination by the fungus-growth method and its comparison with other methods, K. C. HAMNER, W. S. STEWART, and G. MATRONE. (U. S. D. A.). (*Food Res., 8 (1943), No. 6, pp. 444–452*).—The method described involves measurement of the growth of the fungus *Phycomyces blakesleeanus,* as determined from the weight of the mycelial mat developed, on a thiamine-free basal medium supplemented with an acid-aqueous extract of the sample. Growth response at several levels is compared with that obtained with thiamine supplements in increments of from 0.1–0.6 µg. Details of procedure are given for adapting this method to the routine analysis of many samples. Results obtained by this method in the analysis of various samples of potatoes, peas, spinach, cole slaw, carrots, lima beans, and green beans agreed very well with those obtained by the thiochrome method. With meats, however, the former method gave considerably higher results than the latter. A comparison of the fungus-growth and rat-curative (U. S. P. XI) methods, in more than a thousand determinations on samples of tomatoes and wheat, showed somewhat higher results (about 3.6 and 8.5 percent for tomatoes and wheat, respectively) by the fungus-growth method. This method gave consistent results with a low error on many samples of wheat.

Modifications of A. O. A. C. chick method of vitamin D assay, R. J. EVANS and J. L. ST. JOHN. (Wash. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem., 27 (1944), No. 2, pp. 283–289, illus. 2*).—This is a report of a study to determine the relative value of ashing different portions of the tibias and the toes for the A. O. A. C. chick vitamin D assay method (E. S. R., 85, p. 5). The results obtained showed that the middle toe of the chick, extracted with alcohol and ether, can be satisfactorily used to replace the tibia for ashing, and that the unextracted toe can be used equally well. The toes are slightly more sensitive than the tibias, and the procedure is also much more rapid and makes unnecessary the sacrifice of the chick at the conclusion of the assay. The percentage of ash in the distal cartilage was found to give the most sensitive response to added levels of Vitamin D, while the percentage of ash in the shaft gave the least. At 3 weeks of age the proximal cartilage showed no increase in percentage of ash resulting from increased vitamin D in the diet.

Optics of the electron microscope, J. M. KUEHNE (*Tex. Acad. Sci. Proc. and Trans., 27 (1943), pp. 39–40*).—An abstract.

AGRICULTURAL METEOROLOGY

General meteorology, H. R. BYERS (*New York and London: McGraw-Hill Book Co., 1944, pp. 645+, illus. 300*).—"The present need in meteorology seems to be for a general text embodying fundamentals as well as the modern developments in synoptic meteorology. More and more dynamic meteorology and synoptic meteorology lose their separate identities, and a general broad treatment of the subject becomes necessary. . . . This book is an attempt to meet this need."

Elementos de meteorología, E. FONTSERÉ (*Barcelona: Editorial Gustavo Gili, 1943, pp. 358+, illus. 183*).

Nitrogen in the biogeochemistry of the atmosphere, G. E. HUTCHINSON (*Amer. Sci., 32 (1944), No. 3, pp. 178–195, illus. 1*).—This review (58 references) considers the terrestrial distribution of N, juvenile N, inorganic fixation of N in the biosphere, biological fixation of N, bacteriological regulation of the composition of the atmosphere, and speculations on the evolution of the N cycle.

The diurnal variation of warm-frontal precipitation and thunderstorms, R. V. DEXTER (*Roy. Met. Soc. [London], Quart. Jour., 70 (1944), No. 304, pp. 129–137, illus. 7*).—It is known that warm-frontal precipitation areas increase at night and decrease during the day, also that warm-frontal thunderstorms tend to be more numerous at night than in the afternoon. The following explanation is offered: Since there is a direct relation between the amount of potential instability in the warm air and the amount of precipitation subsequently produced as the air ascends the warm-frontal surface, the maximum should come when the maximum potential instability is being realized. Maximum potential instability is developed in the warm air in contact with the ground in late afternoon but is realized only after lifting, so that the time of maximum rainfall is postponed for 6–10 hr., occurring in late evening or early morning. This maximum reaches the edge of the precipitation area 8 or more hours after development of the instability, thus increasing the width of the area in the late night and early morning hours. The development of cyclonic curvature, which accompanies realization of the potential instability in the ascending current, may also be a contributing factor. Because latent instability is associated with potential instability, since if the latter is present the former may develop through lifting, the maximum number of warm-frontal thunderstorms likewise occurs in late evening or early morning, 6–10 hr. after maximum potential instability has developed.

Subtropical rainshowers from stable cloud forms, R. H. SIMPSON (*Amer. Met. Soc. Bul., 25 (1944), No. 9, p. 367*).—Brief report on a case at Miami, Fla.

Hurricanes: Their nature and history, particularly those of the West Indies and the southern coasts of the United States, I. R. TANNEHILL (*Princeton, N. J.: Princeton Univ. Press; London: Oxford Univ. Press, 1944, 5. ed., pp. 269+, illus. 121*).—With improved communications and more helpful observations, "hurricane forecasting has made better progress in the last few years than in any equal period since wireless first brought weather reports from ships at sea. This progress is shown in the accounts of recent hurricanes." This edition of the book previously noted (E. S. R., 79, p. 584) records about 1,000 tropical storms covering 4.5 centuries—a rich field for the worker who believes that there are cycles or patterns in the irregular but unceasing march of these storms which can be related to casual factors outside the storm field and the momentary drift of the atmosphere over tropical waters.

A relationship between evaporation and temperature, J. A. PRESCOTT (*Roy. Soc. So. Austral. Trans., 67 (1943), pt. 1, pp. 1–6, illus. 3*).—In the formulation of climatic indexes, various attempts have been made to develop factors in which the effect of evaporation in controlling the efficiency of rainfall is expressed as a function of temperature without taking atmospheric humidity into account. In this study, the relationship between mean monthly evaporation and mean monthly temperature for a range of Australian stations was found to be best expressed in terms of a difference in phase which is a function of distance from the ocean. The relationship between evaporation and phase-displaced temperature was satisfactorily expressed by an equation of the form $E = a + bT + ce^{dT}$, in which E is the monthly evaporation expressed in inches, T is the corresponding monthly phase-displaced temperature expressed in degrees Fahrenheit, and a, b, c, and d are constants. This equation was fitted to some 30 sets of records and some correlations were sought, but the records were not consistent enough to enable a general equation to be applied for all or part of southern Australia.

The cottontail and the weather, H. C. HANSON. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 91–97, illus. 1*).—During the winter of 1941–42, 100 cottontail rabbits were trapped in Wisconsin; the daily catch through this period showed fluctuations apparently corresponding with barometric pressures. On the basis of the limited evidence presented, it is suggested that there exists a pressure-activity rhythm in many species of small mammals. There are 14 references.

On verification of weather forecasts, H. H. CLAYTON (*Amer. Met. Soc. Bul., 25 (1944), No. 9, p. 368*).—A brief note on methodology, with references to a previous paper by the author (E. S. R., 87, p. 340) and to a recent one by Muller (E. S. R., 91, p. 385).

Monthly Weather Review, [August-September 1944] (*Mo. Weather Rev. [U. S.], 72 (1944), Nos. 8, pp. 171–186, illus. 10; 9, pp. 187–204, illus. 16*).—In addition to meteorological, climatological, solar radiation, and sunspot data, No. 9 contains an article on The North Atlantic Hurricane of September 8–16, 1944, by H. C. Sumner (pp. 187–188).

SOILS—FERTILIZERS

The soil resources of Texas, W. T. CARTER. (U. S. D. A. coop. Tex. Expt. Sta.). (*Tex. Acad. Sci. Proc. and Trans., 27 (1943), pp. 187–204*).—A presentation of the basis of soil classification and consideration of the extent and characteristics of the soil groups of Texas.

Structure of Houston black clay as reflected by moisture equivalent data, N. L. STOLTENBERG and C. W. LAURITZEN. (U. S. D. A.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 11, pp. 922–927, illus. 1*).—Data presented comprise results obtained from determinations of moisture equivalent made on samples of Houston black clay, consisting of natural clods and soil crushed to pass through 2- and 0.25-mm. sieve openings, and these results supplemented by density determinations on the samples following centrifuging. Relationship between the structure and stability of structure of Houston black clay and the moisture equivalent is discussed, and comparisons are made between samples from a meadow and a cultivated field. The authors conclude that the moisture equivalent of Houston black clay is primarily dependent on the structure of the soil in its undisturbed state and the stability of that structure during the breaking up to pass a 2-mm. sieve. The meadow soil was found to be aggregated better, and the aggregates had a greater stability. The importance of the manner and degree of crushing of the soil prior to a moisture equivalent determination is pointed out.

Soil granulation and percolation rate as related to crops and manuring, W. A. ALBRECHT and J. SOSNE. (Mo. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 646–648, illus. 1*).—Soils investigated were taken from four experimental plats of Sanborn field at the Missouri Experiment Station. The following soil treatments, all since 1888, were studied: Wheat continuously; wheat with 6 tons manure per acre; corn; and corn with 6 tons manure per acre. Laboratory studies indicated in particular the effect of manure as organic matter by the greater granulation and increased infiltration resulting from this treatment.

A greater stability of the granules was found as suggested by the nearly constant rate at which water percolated through a shallow soil layer for a limited time in contrast to its decreasing rate of percolation with time for the unmanured soils. The results point to the less commonly recognized differences within the soils themselves that will modify their behavior in relation to rainfall and running water. They point particularly to the value of organic matter turned into the soil as it may be responsible for these differencees, not readily recognizable by casual observation.

Lysimeter experiments.—VI, The effects of cropping and fertilization on the losses of nitrogen from the soil, J. A. BIZZELL ([*New York*] *Cornell Sta. Mem. 256 (1944), pp. 14*).—This publication provides additional data (E. S. R., 90, p. 591) on the losses of nitrogen from the soil resulting from the application of relatively large quantities in such soluble form as nitrates or farm manure. Detailed records of losses are presented. Two experiments are reported with Dunkirk silty clay loam, using different cropping and fertilization. In one experiment, timothy was grown continuously, with the nitrogen applied as sodium nitrate, while in the second experiment corn, oats, and timothy were grown in a 4-yr. rotation, with farm manure applied to the corn and ammonium nitrate to the timothy.

Lysimeter drainage when a continuous timothy crop was used contained only very small amounts of nitrogen, regardless of quantities of sodium nitrate applied. Drainage when the rotation crops were used was higher in nitrogen, but the maximum quantity was not considered excessive. With continuous timothy crops, the nitrogen content of the soil at the end of the experiment was approximately the same as at the beginning, regardless of the amount of sodium nitrate applied. The soil under rotation crops, which received 677 lb. per acre of nitrogen in the form of farm manure, gained 618 lb. of nitrogen.

The largest applications of nitrogen to the soil were followed by removals of nitrogen in excess of that contained in the crops taken off. With continuous timothy crops, an annual application of 124 lb. per acre of nitrogen resulted in an annual loss of 11 lb. per acre of nitrogen. An annual application of 110 lb. per acre of nitrogen in the corn-oats-timothy rotation was accompanied by annual loss of 38 lb. of nitrogen. Losses of nitrogen from Dunkirk silty clay loam are not likely to be excessive even when comparatively large quantities of soluble nitrogen are used as a fertilizer.

Influence of phosphorus and potassium on symbiotic nitrogen fixation, J. L. Roberts and F. R. Olson. (Ind. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 8, pp. 637–645*).—Soils from long-established soil-fertility experimental plots were investigated to determine the role of P and K in symbiotic fixation. The following soil types were investigated under field or greenhouse conditions: Brookston silt loam; Bedford silt loam; Crosby silt loam; Plainfield sand; and Clermont silt loam.

Nitrogen content of several experimental plots studied, on which a rotation including legumes was used, was higher with phosphatic and potassic fertilizers than where no fertilizers were applied, in spite of greater removal of nitrogen by crops from fertilized plots. In some cases, the nitrogen gain due to use of phosphorus and potassium was as much as 40 lb. of nitrogen per acre per year. Use of phosphorus and potassium on corn and wheat at one location caused an increase in the number of nodules and percentage of nitrogen content of soybeans and lespedeza grown in subsequent years. In greenhouse experiments fertilization of soybeans, alfalfa, and alsike clover increased nitrogen fixation by as much as 30 percent in some cases.

Soybeans deficient in phosphorus were found to be relatively lower in percentage nitrogen content and to contain a somewhat higher concentration of soluble nitrogen than normal plants. Soybeans deficient in potassium were relatively higher in percentage nitrogen and contained a lower concentration of soluble nitrogen than normal plants.

The contributions made by sugar-cane roots to soil organic matter: With particular reference to Trinidad and Barbados, F. Hardy (*Trop. Agr.* [*Trinidad*], *21 (1944), No. 11, pp. 203–209*).—Data from Trinidad and Barbados from weights of root residues contained in soil cores show that the contribution which these residues make to the supply of soil organic matter is small, being around 3,500 lb. per acre 6-in. of soil, or 0.20 percent of soil weight. By contrast, cane trash contributes considerably greater quantities of organic matter of the order of 20,000 lb. per acre, or 1.14 percent of soil weight.

Foliar diagnosis and plant nutrition in fertilizer placement experiments, W. Thomas, W. B. Mack, and E. M. Rahn. (Pa. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 11, pp. 889–902, illus. 4*).—Allegheny sweet corn was grown on Hagerstown silty clay loam under 400 lb. per acre of a 4–16–4 fertilizer (except where the fertilizer was applied in solution where relatively soluble material was used). Methods of placement compared were: No fertilizer; fertilizer plowed down in bands at the bottom of a 7-in. furrow; fertilizer in solution form in the row with the seed; and fertilizer in a single continuous band along one side of the row, 3 in. from the row and 3 in. deep. The method of foliar diagnosis was applied to the examination of the nutrition with respect to fertilizer conditions under the above treatments. Highest yield of unhusked ears was obtained by plowing down the fertilizer in a band at the bottom of the furrow at a depth of 7 in., followed in order of yields by the plot receiving the fertilizer in solution form in the row, and then by the plot to which the fertilizer was applied in a single band beside the row at a depth of 3 in. Relationships of the data of leaf composition to the yields obtained under the different methods of placement are adequately expressed by means of foliar diagnosis indices which are defined.

The use of acidifying materials on calcareous soils, D. W. THORNE. (Utah Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 10, pp. 815–828, illus. 2*).—Field, greenhouse, and laboratory experiments are reported on the influence of acidifying treatments on yield and chemical composition of plants growing on various calcareous soils. In a field experiment on Taylorsville silty clay loam, which contains 5–8 percent lime, the yields of wheat, potatoes, and sugar beets were not increased by sulfur, sulfur and manure compost, or phosphoric acid over the yields of comparable nonacidified treatments. In a 12-yr. study on Millville loam, which contains over 40 percent lime, sulfur and rock phosphate added to manure did not result in better yields than manure treatments alone. In greenhouse studies, the yields of alfalfa, barley, and corn growing on three different calcareous soils were not significantly increased by acidifying treatments, including two rates of sulfur, sulfuric acid, and phosphoric acid, over yields obtained from comparable treatments that were not acidifying. Irrigation water acidified to pH 3.0 by sulfuric acid decreased the yield of alfalfa. In a greenhouse test with two calcareous soils and one noncalcareous soil, water acidified to pH 3.0 and to pH 5.0 with sulfuric acid had no significant effect on the yield or mineral content of tomato plants, but the treatments decreased the yield of alfalfa.

Banded applications of sulfuric acid, dried manure, and treble superphosphate in various combinations showed no distinctive effects on calcareous soil compared with their effects on the noncalcareous soil in regard to yield, or to iron, manganese, or calcium contents of tomato plants. Alfalfa following the tomatoes was significantly decreased in yield by acidified irrigation waters. Phosphate content of alfalfa was significantly increased by the banded treatment combination of manure, sulfuric acid, and concentrated superphosphate. Water-soluble calcium determinations gave more consistent values in relation to the effects of sulfur and sulfuric acid treatments than did pH. Phosphoric acid decreased the pH of some soils but did not increase the calcium solubility. Farm manure treatments did not result in changes in either pH or soluble calcium in soils. The acidifying treatment showed no relationship to phosphorus soluble in a pH 5 acetate buffered solution.

The author concludes from the results of this study and other reported investigations on the use of acidifying materials on calcareous soils that there is insufficient evidence to date to warrant any widespread recommendation of such treatments for benefiting plant nutrition and growth. The value of acidifying agents in preventing phosphate reversion in calcareous soils has not been studied extensively enough to warrant conclusions.

Lime for health, G. G. POHLMAN and C. R. ORTON (*West Virginia Sta. Cir. WS 21 (1944), pp. [8], illus. 3*).—This popular leaflet presents information on the importance, need, kind, and effect of lime on crop yields and quality.

Inspection of commercial fertilizers, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul. 353 (1944), pp. 7+*).—The chemical analyses of 36 brands of fertilizer and fertilizer materials collected during the year ended June 1944 are tabulated.

Analyses of commercial fertilizers, manures, and agricultural lime, 1943, C. S. CATHCART (*New Jersey Stas. Insp. Ser. 13 (1944), pp. 31*).—Statistical data, including analyses, are presented on commercial fertilizers, fertilizer materials, and agricultural lime sold in New Jersey.

Commercial fertilizers in 1943–44, G. S. FRAPS and T. L. OGIER (*Texas Sta. Bul. 662 (1944), pp. 28*).—This bulletin presents statistics regarding fertilizers sold in Texas, information regarding the fertilizer law, and analyses of samples of the fertilizers sold.

Report on inspection of commercial fertilizers and agricultural lime products for 1944, L. S. WALKER and E. F. BOYCE (*Vermont Sta. Bul. 516 (1944), pp. 12*).—A statistical summary of fertilizer sales as required by the Vermont fertilizer law. In addition to commercial fertilizers and lime products, the analyses cover animal manures. Several suggestions are given for the guidance of purchasers.

AGRICULTURAL BOTANY

Thomas Jefferson: His interest in plant life as revealed in his writings, I, E. H. FULLING (*Bul. Torrey Bot. Club, 71 (1944), No. 6, pp. 563–598*).—With bibliographic footnotes.

The botanical collections of Wilhelm N. Suksdorf, 1850–1932, W. A. WEBER (*Wash. State Col. Res. Studies, 12 (1944), No. 2, pp. 51–121, illus. 2*).—The collections (now the property of the State College of Washington) and studies of Suksdorf covering a period of over 50 yr. were made on the varied vegetation of the Columbia Gorge and the rugged Cascade Range, particularly in the region around Mt. Adams, at a time when the region was practically undisturbed; he was therefore able to discover for the first time many mosses, fungi, ferns, and flowering plants previously unknown to science. The author presents a brief biographical sketch of Suksdorf and a study of his collections and work, including the itinerary of all his botanical excursions (1872–1932), the botanical entities based on his collections, a gazetteer of the localities visited, and a list of source material.

The importance of plants, W. J. ROBBINS (*Science, 100 (1944), No. 2603, pp. 440–443*).—An address by the vice president and chairman for 1943 of the Section for Botanical Sciences, American Association for the Advancement of Science (September 1944), considering plants as the basis of life and their recreational value and economic importance.

[Abstracts of papers presented before the general, physiological, and systematic sections of the Botanical Society of America] (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 1s–7s, 8s–14s*).—Included are papers—in part from State experiment stations—by various authors on the following subjects: Tissue culture studies in *Tropaeolum*, *Lupinus*, tobacco, and sunflower, rooting excised embryos by micrografting, and grafting monocotyledons; advances of the forest in Iowa, and vegetation types determined by aerial photographs; cross-pollination sterility in pines, foreign-pollen behavior in *Datura* pistils, abnormalities in interspecific hybrid embryos of *Datura*, gene action in corn leaf development, inheritance in sesame, and chimeras of *Lycopersicon* and *Sanseveria*; nature and developmental rate of noxious weeds in Kansas, cultivation effects on food reserves in field bindweed, and alligator weed (*Alternanthera*) in Louisiana; antiquity of tobacco culture in the Southwest, and uncultivated food plants used by Ramah Navaho Indians; tetraploidy effects on Russian dandelion, analogous plant types of guayule and mariola and crosses between these species, and growth inhibitors in plant extracts and in guayule; germination inhibitor in cabbage seed coats, auxin (and precursor) extraction from green tissues, new growth substances and technics, mechanism of auxin action, and ascorbic acid in Douglas fir needles; Fe and Mn antagonistic in soil and solution cultures, and microincineration and mineral analysis of plant tissues; O_2 evolution in chloroplast suspensions (after drying, freezing, and disintegration), quantum field of O_2 production by chloroplast suspensions, and anaerobic O_2 debt in plant tissues; electron microscope studies (on cellular plasts, cellulose particles, and colloidal C), phase difference microscopy for living protoplasm, and cell number in developing oats coleoptiles; growth rate and fruit size in cucurbits, root tip differentiation in timothy grass, surface tension in slime mold differentiation, endosperm regeneration in gymnosperms and angiosperms, shoot-root ratio and moisture relations, and redox systems and potentials v. tissue differentiation and development in vascular plants; *Penicillium notatum* metabolism; hyocyamine translocation in *Datura;* and fresh-water algae in Louisiana.

[Reviews of recent advances in plant biochemistry] In *Annual Review of Biochemistry, XIII,* edited by J. M. LUCK and J. H. C. SMITH. *Stanford University, Calif.: Ann. Rev., Inc., 1944, vol. 13, pp. 575–704*).—The following comprehensive reviews of research in the botanical field are included: Photoperiodism in Plants, with 112 references, by K. C. Hamner (pp. 575–590) (U. S. D. A.); Chloroplast Pigments, with 158 references, by H. H. Strain (pp. 591–610); Mineral Nutrition of Plants, with 53 references, by F. J. Richards (pp. 611–630); Growth-Regulating Substances in Plants, with 207 references, by J. van Overbeek (pp. 631–666); and Biochemistry of Fungi, with 333 references, by E. L. Tatum (pp. 667–704).

[Abstracts and short papers] (*Tex. Acad. Sci. Proc. and Trans., 27 (1943), pp. 69, 81–91, 98–102, 114–116*).—The following are included: Responses of the *Avena* Coleoptile to Mechanical Stimuli, by A. R. Schrank (p. 69); The Mesa Region of Texas—An Ecological Study, by B. C. Tharp (pp. 81–91); Photoperiodic "Induction" and "After-Effects," by V. A. Greulach (pp. 98–99); The Colloidal Complex as a Factor in Plant Nutrition, by H. E. Hampton (pp. 100–102) (Tex. A. and M. Col.); and Fungus Slide Cultures—New Methods, by M. B. Morrow and M. Germaine Rachaner (pp. 114–116).

[Abstracts of theses] (*Iowa State Col. Jour. Sci., 19 (1944), No. 1, pp. 11–14, 32–34, 38–40*).—The following are included: Effects of Carbon Dioxide and Oxygen on Absorption by Roots, by H. T. Chang; Pyruvate Dissimilation by Bacterial Enzyme Preparations, by G. Kalnitsky; and The Fermentative [Yeast] Production of Glycerol, by T. M. Lees.

[Abstracts of dissertations] (*Md. Univ. Off. Pub., 41 (1944), No. 6, pp. 15–18*).—The following are included: Nucleolar Numbers and Attachments in *Lilium,* by W. J. Haney (pp. 15–16); Tetraploid Segregation in *Antirrhinum majus* L., by T. M. Little (pp. 16–17); and Polycotyledony in the Genus *Lycopersicon,* by G. B. Reynard (pp. 17–18).

Cornell University abstracts of theses, 1943 (*Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 321–322, 339–341, 345–346, 420–428*).—The following are of botanical interest: Some Studies on Amino Acid Metabolism by the Genus *Proteus,* by K. E. Anderson (pp. 321–322); The Behavior of *Streptococcus lactis* at Low Temperatures, by H. B. Naylor (pp. 339–341); Some Studies on the Floral Anatomy and Morphology of the Saxifragaceae, by E. A. Palmatier (pp. 345–346); The Effect of Certain Ecological Factors on the Growth of the Radish (*Raphanus sativus* L.), by A. M. Mahrouki (pp. 420–425); and A Study of Factors Influencing Floral Initiation and Seedstalk Development in the Onion (*Allium cepa* Linn.), by G. W. Woodbury (pp. 426–428).

[Abstracts of papers] (*Va. Acad. Sci. Proc., 1944, pp. 41, 42-43, 43*).—The following are included: Viability of Nodule Forming Bacteria on Inoculated Leguminous Seed as Affected by Storage, by F. S. Orcutt and A. L. Whitman (Va. A. and M. Col.); Economic Aspects of Fasciation, by O. E. White; and Inheritance Studies With the Madagascar Periwinkle, by W. S. Flory, Jr. (Va. Expt. Sta.).

Bacterial proteinase from waste asparagus butts, L. KLINE, L. R. MACDONNELL, and H. LINEWEAVER. (U. S. D. A.). (*Indus. and Engin. Chem., 36 (1944), No. 12, pp. 1152–1158, illus. 8*).—The press juice from waste asparagus butts and trimmings was found to have potentialities for use in industrial microbiological media. The authors describe the use of this juice for producing bacterial proteinase, reproducible yields of this enzyme being obtained on asparagus juice media by controlling the pH and the concentrations of Ca, N, carbohydrate, and phosphate and by care in the culture technic employed. The culture filtrates containing the proteolytic enzymes were comparable to those obtained in commercial practice.

A micro-glucide dish, R. DEVIGNAT (*Jour. Bact., 48 (1944), No. 4, pp. 491–494, illus. 2*).—Because of the difficulties in obtaining chemically pure products the author endeavored to develop a microtechnic for studying bacterial carbohydrate fermentation. By the method described and used on over 500 strains since 1941, there have not only been notable gains in incubator room and the saving of time in preparing the material, inoculating the bacteria, and reading the data, but also a practical constancy of results making possible the comparison of action on the different materials employed.

Screw-capped bacteriological culture tubes, S. F. SNIESZKO. (Maine Expt. Sta.). (*Science, 100 (1944), No. 2602, pp. 435–436, illus. 1*).—Suggested modifications in a screw-capped test tube now on the market are described which are said to increase considerably its usefulness for bacteriological work.

Ribonucleic acid and the gram stain, J. W. BARTHOLOMEW and W. W. UMBREIT. (Wis. Expt. Sta.). (*Jour. Bact. 48 (1944), No. 5, pp. 567–578, illus. 9*).—Evidence is presented, from a technic using bile salts and ribonuclease, in support of the conclusions that ribonucleic acid exists in the outer layer of gram-positive organisms and in combination with Mg and the cell protein is responsible for the gram reaction therein. The apparent size difference between gram-positive and gram-negative forms of the same organism is due not to the precipitation of the gram reagents but to the visibility of the outer layer. The indications are that sulfhydryl groups are involved in the over-all gram reaction.

The cause of variation in the relationship between titratable acidity and hydrogen ion concentration among lactic acid bacteria, C. S. PEDERSON and J. V. BAGG. (N. Y. State Expt. Sta.). (*Jour. Bact., 48 (1944), No. 5, pp. 559–566, illus. 7*).—The relationship between the final H-ion concentration and titratable acidity as produced by various lactic acid bacteria was found to depend not only on the buffer content of the medium but also on the proportional amount of the various acids—especially lactic and acetic—produced during fermentation. The proportional amount of lactic and acetic acids produced during fermentation depended not only on the series used but also on other factors—especially the type of sugar fermented. The final H-ion concentration produced during fermentation was not alone the limiting factor for fermentation. A higher H-ion concentration was attained when lactic acid was the primary acid formed than when a fairly large amount of acetic acid was produced.

The identification of "Streptococcus lactis R" as a strain of Streptococcus faecalis, I. C. GUNSALUS, C. F. NIVEN, JR., and J. M. SHERMAN. (Cornell Univ.). (*Jour. Bact., 48 (1944), No. 5, p. 611*).—On the basis of physiological, nutritive, and serological and characteristics, *S. lactis* R was identified as an enterococcus, specifically *S. faecalis*.

Die serologische Differenzierung von Streptokokken [The serological differentiation of streptococci], W. KAUFMANN (*Zentbl. Bakt. [etc.], 2. Abt., 106 (1944), No. 13–15, pp. 287–301*).—It is concluded on that basis of experimental results that the group differentiation of streptococci by this method must be considered as practically applicable. There are 32 references.

Diversion of the lactic acid fermentation with oxidized substrate, I. C. GUNSALUS and J. J. R. CAMPBELL. (Cornell Univ.). (*Jour. Bact., 48 (1944), No. 4, pp. 455–461, illus. 2*).—By use of an oxidized substrate and a shift during growth to an alkaline pH, it was found possible to eliminate lactic acid as a fermentation product of certain homofermentative lactic acid bacteria; thus the lactic acid fermentation is not essential to the reactions yielding growth energy for these organisms. The fermentation products of citric acid at pH 8.5 were 1 mole each of CO_2 and formic acid and 2 moles of acetic acid. At an acid reaction, acetylmethylcarbinol was formed and lactic acid became an important product of citric acid fermentation. These changes were accompanied by an increase in CO_2 paralleling the increase in lactic acid plus acetylmethylcarbinol; a corresponding decrease in the yield of formic and acetic acids occurred. Cell suspensions harvested from a citrate-containing medium yielded approximately the same products as growing cultures; with resting cells, however, pyruvic acid accumulated at an alkaline reaction. The findings indicate the presence of several enzymes similar to those in other types of organisms.

Studies on cellulose fermentation.—I, The culture and physiology of an anaerobic cellulose-digesting bacterium, R. E. HUNGATE (*Jour. Bact., 48 (1944), No. 5, pp. 499–513, illus. 2*).—*Clostridium cellobioparus* n. sp. isolated from the rumen of cattle differed from other bacteria of the group in being easily isolated and in growing well on both glucose and cellulose. No tendency toward loss of cellulose-digesting capacity during 4 yr. of pure culture was noted. The growth requirements were satisfied by an inorganic medium with added biotin and a carbohydrate. A variety of sugars were decomposed. The fermentation products were acetic, formic, and lactic acids, ethyl alcohol, CO_2, and H; other products—amounting to 30 percent of the substrate—were not identified. Cellobiose was the chief digestion product of cellulose; no glucose was formed.

Starch hydrolysis and fermentation by the yeast Endomycopsis fibuliger, L. J. WICKERHAM, L. B. LOCKWOOD, O. G. PETTIJOHN, and G. E. WARD. (U. S. D. A.). (*Jour. Bact., 48 (1944), No. 4, pp. 413–427, illus. 1*).—Under certain conditions this yeast was found to be a potent diastatic agent; the ratio of α- to β-diastase was high. Two groups of *E. fibuliger*, aggregating 20 strains, were studied, and the detailed results are discussed. The use of *Endomycopsis* cultures for hydrolysis of starch in the butylene glycol fermentation gave total yields of butylene, glycol, ethyl alcohol, and acetylmethylcarbinol equivalent to the yields obtained with malt-saccharified mashes. The amount of alcohol produced in mashes saccharified by *Endomycopsis*, however, was greater than that produced in malt-saccharified mashes. This is believed to be the first demonstration of an extra-cellular amylase system in a member of the Endomycetaceae (sensu Stelling-Dekker) or related imperfect yeasts.

Factors which influence the growth of heat-treated bacteria.—II, Further studies on media, F. E. NELSON. (Kans. Expt. Sta.). (*Jour. Bact., 48 (1944), No. 4, pp. 473–477*).—In this contribution (E. S. R., 89, p. 421), it is reported that variation of the tryptone content, addition of thioglycollic acid, and differences in time of addition of peptone in preparing the medium may influence the numbers of certain nonsporulating bacteria which develop into countable colonies following sublethal heat treatment. The observed variations in colony counts of heat-treated bacteria may result from alterations in the physiocochemical character of the medium; a more reduced potential is considered favorable for initiating growth of heat-injured cells and thus for forming greater numbers of countable colonies.

Influence of bacteriologic peptones on hydrogen sulfide, indol, and acetyl methyl carbinol production by Enterobacteriaceae, C. E. GEORGI and M. E. McMASTER. (Univ. Nebr.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 185–189, illus. 1*).—Production of H_2S by these bacteria varied greatly with the indicator ion used; Bi was superior as a detector to Fe or Pb. Occasionally the tryptophan content but rarely the guanidine configuration served as limiting factors in peptones used for differential bacterial tests.

Serum albumin as a food for human tubercle bacilli, D. M. POWELSON and J. R. McCARTER. (Wis. Expt. Sta.). (*Jour. Bact., 48 (1944), No. 4, pp. 479–481*).

Dorset's synthetic agar medium with human serum albumin was shown to be comparable in efficiency to Corper's egg-yolk medium. Addition of serum albumin to a liquid medium would probably also allow growth of single cells of human tubercle bacilli.

Antibiotic substances produced by soil bacteria, J. C. HOOGERHEIDE (*Bot. Rev., 10 (1944), No. 10, pp. 599–638*).—"The isolation of *Bacillus brevis* by Dubos in 1939 and the subsequent study of the active principles excreted by this species have opened a new field for discovery of new chemotherapeutic agents for human, animal, and possibly also for plant diseases." Studies of such agents isolated from soil bacteria are reviewed (145 references), with special reference to gramicidin, tyrocidine, actinomycin A and B, actinomycetin, and streptothricin, as well as to various other antibiotics. It is believed that the important feature of such investigations lies in the fact that after chemical identification it becomes possible to prepare derivatives that may prove more active than the mother substances produced by the microorganisms. Soil microbiology may thus "even become the basis on which chemotherapy can develop from the almost complete empirical stage of today to a broad science of utmost importance tomorrow. Although very little attention so far has been paid to antibiotic substances against plant pathogens, including fungi, the broad principles outlined in this review are also adaptable for this group of pathogenic organisms."

Isolation of antibiotic substances from soil micro-organisms, with special reference to streptothricin and streptomycin, S. A. WAKSMAN, E. BUGIE, and A. SCHATZ. (N. J. Expt. Stas.). (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 19 (1944), No. 23, pp. 537–548*).—Production of streptothricin and streptomycin by certain actinomycetes was found greatly influenced by the composition of the medium and by conditions of growth. Tryptone or peptone and glucose favored their formation, the nitrogenous substance acting as a substrate from which the antibiotic is produced (established at least for streptothricin) and the carbohydrate apparently serving as a buffer to prevent rapid alkalinization of the medium. The two antibiotics are similar in chemical behavior and in many biologic properties. They are stable against destruction by various organisms, sensitive to increasing acidity and to glucose in the medium, and are both resistant to high temperatures. They act on various gram-positive and gram-negative bacteria, but differ in the fact that streptothricin is more active against certain bacteria within each group—e. g., *Bacillus mycoides* and *Mycobacterium tuberculosis* in the first and *Proteus vulgaris* and *Pseudomonas aeruginosa* in the second. These substances are characterized by limited toxicity to animals and by high activity in vivo against various gram-positive and gram-negative bacteria.

Some growth patterns of bacteria in cylinder plate tests for promoting and inhibiting substances, P. R. BURKHOLDER (*Amer. Jour. Bot., 31 (1944), No. 9, pp. 555–558, illus. 15*).—Preliminary observations are reported on different types of centric growth patterns obtained in agar plates of bacteria and yeast when various solutions were supplied in test cylinders, including antibiotics from molds and lichens, an inorganic poison, vitamins, and amino acids. By controlling the composition of the nutrient agar and adding appropriate mixtures of known substances to the cups, it was possible to simulate some of the phenomena observed with crude solutions obtained from antibiotic mold cultures and lichens.

Chaetomin, a new antibiotic substance produced by Chaetomium cochliodes, I, II. (N. J. Expt. Stas.). (*Jour. Bact., 48 (1944), No. 5, pp. 527–536, illus. 1*).

I. *Formation and properties,* S. A. Waksman and E. Bugie (pp. 527–530.)—When grown on suitable media this ascomycetous fungus isolated from the soil produced an antibiotic substance—designated chaetomin—which proved active principally against gram-positive bacteria.

II. *Isolation and concentration,* W. B. Geiger, J. E. Conn, and S. A. Waksman (pp. 531–536).—Chaetomin—found both in the culture filtrate and in the mycelium, but in much larger amounts in the latter—was extracted from the filtrate by ethyl acetate and from the mycelium by acetone; it was repurified by washing with $NaHCO_3$ and Na_2CO_3 and further purified by treating with petroleum ether and by chromatographic absorption. Chaetomin contains N and S, but differs greatly in biological activity from gliotoxin and penicillin; although similar in some ways to tyrothricin, it also differs considerably from this substance. It is largely active against gram-positive bacteria, having little if any effect on gram-negatives. Preparations having 500 million or more *Staphylococcus aureus* units have been obtained.

Antibacterial substances in organs of higher plants, E. H. Lucas and R. W. Lewis. (Mich. State Col.). (*Science, 100 (1944), No. 2609, pp. 597–599*).—This search—by methods described—concerned particularly (1) the root systems of plants and (2) those plants mentioned in the folklore of numerous countries as beneficial in cases of bacterial infection; the results reported in this preliminary account show that some higher plants do contain antibacterial principles at certain stages of their development. Thus a wide field is opening for exploration. It is believed that the problems to be encountered will be of a general biological nature rather than confined to the interrelations between bacteria and higher plants, and "it is not illogical to suspect that the resistance of some plants to disease is due to the presence in the host cells of distinct chemical substances which are antibiotic to specific pathogens. The development of antifungal principles, similar in their action to the antibacterial substances, is not outside the realm of possibility."

Allicin, the antibacterial principle of Allium sativum.—I, Isolation, physical properties, and antibacterial action, C. J. Cavallito and J. H. Bailey (*Jour. Amer. Chem. Soc., 66 (1944), No. 11, pp. 1950–1951*).—A new type of antibacterial was isolated from the cloves of garlic; this substance—name "allicin"—is a colorless oil, approximately 2.5 percent soluble in water, and relatively unstable. Its antibacterial action was demonstrated against gram-positive and gram-negative bacteria.

Myxomycetes of the San Francisco region, R. and J. Pratt (*Amer. Jour. Bot., 31 (1944), No. 9, pp. 559–561*).—This list of slime molds represents the species and varieties found since December 1942 on a number of excursions to likely hunting grounds during appropriate seasons of the year—all within 20 miles of San Francisco.

Zoösporogenesis in the resistant sporangia of Allomyces arbusculus, W. R. Hatch. (Wash. State Col. et al.). (*Mycologia, 36 (1944), No. 6, pp. 650–663, illus. 2*).—Zoosporogenesis in resistant sporangia is not normally initiated until the latter have been dried and/or placed in fresh water or nutrient solution. The number of zoospores per resistant sporangium is about four times as great as that of ♀ gametes produced in the ♀ gametangium—a structure of approximately the same volume. The volume at cleavage of zoospores from a resistant sporangium is about a fourth as great as that when swarming and as that of ♀ gametes at cleavage.

Life cycles and phylogeny in the higher fungi, H. S. Jackson (*Roy. Soc. Canada Trans., 3. ser., 38 (1944), Sect. V, pp. 1–32, illus. 5*).—An address, with over three pages of references.

A cultural and cytological investigation of a two-spored Basidiomycete, Aleurodiscus canadensis n. sp., A. J. Skolko (*Canad. Jour. Res., 22 (1944), No. 5, Sect. C, pp. 251–271, illus. 45*).—A detailed study of the morphology, cytology, genetics, and life cycle of this new fungus species described from branches of white spruce (*Picea canadensis*).

Representatives of the Mesophelliaceae in North America, S. M. Zeller. (Oreg. Expt. Sta.). (*Mycologia, 36 (1944), No. 6, pp. 627–637, illus. 6*).—Includes the new family Mesophelliaceae (suborder Lycoperdineae), two species of *Abstoma* (1 new), and the new genus *Radiigera* with three new species. Identification keys are provided.

Structure and taxonomy of Taenioma, including a discussion on the phylogeny of the Ceramiales, G. F. PAPENFUSS. (Univ. Calif.). (*Madroño, 7 (1944), No. 7, pp. 193–214, illus. 18*).—The author places this genus in the algal family Delesseriaceae of the Ceramiales. There are 45 references.

Notes on the algal genus Taenioma, C. K. TSENG (*Madroño, 7 (1944), No. 7, pp. 215–226, illus. 7*).—A general historical, morphological, taxonomic, and distributional survey of the genus.

Flowering plants and ferns of Vilas County, Wisconsin, J. E. POTZGER. (Univ. Wis. et al.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 139–145*). —Though not considered exhaustive, the list is believed to represent the most common plants in the immediate vicinity of Trout Lake and could form the nucleus for additional systematic collections in this large county of northern Wisconsin.

Plantas curativas de México: Propiedades medicinales de las más conocidas plantas de México, su aplicacion correcta y eficaz [Curative plants of Mexico: Medicinal properties of the better-known plants of Mexico, their correct application and efficacy], L. G. CABRERA (*México: Ediciónes Cicerón, 1943, 2. ed., pp. 299, illus. 133*).—A manual.

Nomina conservanda proposals for ten genera of trees and shrubs, E. L. LITTLE, JR. (U. S. D. A.). (*Madroño, 7 (1944), No. 8, pp. 240–251*).—The 10 genera are *Cedrus, Abies, Coccoloba, Rhacoma, Condalia, Fremontia, Pilocereus, Cephalocereus, Bucida,* and *Halesia.*

Endemism in Crepis, E. B. BABCOCK. (Univ. Calif.). (*Calif. Acad. Sci. Proc., 4. ser., 25 (1944), No. 11, pp. 269–289, illus. 4*).

A new cliff-rose from Arizona, T. H. KEARNEY. (U. S. D. A.). (*Madroño, 7 (1943), No. 1, pp. 15–18*).—*Cowania subintegra* n. sp. is described and compared with other members of the genus.

Two types of broad-leaf Erodium in California, K. A. WAGNON and H. H. BISWELL. (Univ. Calif. and U. S. D. A.). (*Madroño, 7 (1943), No. 4, pp. 118–125, illus. 3*).—Since the growth habits of the two types (*E. botrys* and *E. botrys* f. *montanum*) differ considerably and often have a pronounced effect on the length of time the green forage is available for livestock and on the total bulk of feed produced, it is economically important to be able to differentiate between them; this the authors do by means of descriptions, illustrations, and a key, with general discussion.

Forestiera in southern and southwestern Texas, V. L. CORY. (Tex. Expt. Sta.). (*Madroño, 7 (1944), No. 8, pp. 252–255*).—*F. texana* n. sp. and *F. texana palmeri* n. var. (small trees) are described.

A monograph of the North American species of Fritillaria, D. E. BEETLE. (Univ. Calif.). (*Madroño, 7 (1944), No. 5, pp. 133–159, illus. 4*).—The cytology, morphology, and taxonomy of this liliaceous genus are considered, with key and descriptions for the species and 23 references.

Gilia multiflora Nutt. and its nearest relatives, T. H. KEARNEY and R. H. PEEBLES. (U. S. D. A.). (*Madroño, 7 (1943), No. 2, pp. 59–63*).—A taxonomic study of this member of the phlox family in New Mexico and Arizona, with a key to the species and varieties found there.

Nicotiana arentsii—a new, naturally occurring, amphidiploid species, T. H. GOODSPEED. (Univ. Calif.). (*Calif. Acad. Sci. Proc., 4. ser., 25 (1944), No. 12, pp. 291–305, illus. 6*).—The new species is described from southeastern Peru, with comments on its morphology, distribution, and cytology.

The "gousiektebossie": A study of the morphology, physiology, and eradication of Pachystigma pygmaeum (Schl.) Robyns, M. G. MES and E. DE VILLIERS

(*Union So. Africa Dept. Agr. and Forestry Bul. 245 (1944), pp. 52+, illus. 33*).—A comprehensive study presenting information on the external morphology, propagation, growth, anatomy, physiology, and eradication of this dicotyledonous woody perennial, which is poisonous to cattle and sheep in South Africa.

The story of Parthenium alpinum, G. J. GOODMAN. (Iowa State Col.). (*Madroño, 7 (1943), No. 4, pp. 115–118*).—A brief presentation of historical and taxonomic data.

A new species of Phacelia from Saline Valley, California, L. CONSTANCE. (Univ. Calif.). (*Madroño, 7 (1943), No. 2, pp. 56–59, illus. 1*).—The annual or biennial herb *P. amabilis* n. sp. is described.

Notes on nomenclature in Pinaceae, E. L. LITTLE, Jr. (U. S. D. A.). (*Amer. Jour. Bot., 31 (1944), No. 9, pp. 587–596*).—In checking the nomenclature of the forest trees of the United States with the latest International Rules of Botanical Nomenclature, various notes on the nomenclature of species of the pine family were recorded. No new names or new combinations are said to be needed in this family, but changes in names in use, in authors, and in citation of earlier places of publication are made.

Vigethia, a new genus of Compositae based on Wyethia mexicana Watson, W. A. WEBER. (Wash. State Col.). (*Madroño, 7 (1943), No. 4, pp. 97–100, illus. 2*).

Micromonospora in relation to some Wisconsin lakes and lake populations, A. R. COLMER and E. McCOY. (Univ. Wis.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 187–220 illus. 3*).—This is a report of a survey of 12 lakes of the State, together with an intensive study of 1 lake, in connection with this group of micro-organisms. No association was detected between *Micromonospora* and growing water plants or phytoplankton; an occurrence of a pulse in the bacterial count of open water due to an algal bloom is discussed.

Over five hundred reasons for abandoning the cross-inoculation groups of the legumes, J. K. WILSON. (Cornell Univ.). (*Soil Sci., 58 (1944), No. 1, pp. 61–69*).—Sterilized seed was used to grow plants which were exposed during their growth to bacterial isolates from the nodules of various leguminous plants. The isolates employed were known to symbiose with the plant from which they were obtained, and they comprised 125 stock cultures. The criterion for placing a plant in any cross-inoculation group was the presence of nodules on the roots of the plants. Results indicated that the projected boundaries around the 22 proposed cross-inoculation groups which have been built up during the last 56 yr. overlap so much that it appears impossible to assign a plant to one group or to have an organism that was specific for a group. This statement is justified by over 500 recorded cases in which plants could be assigned to more than one group. The author suggests, therefore, that each of these cases constitutes a reason for abandoning the cross-inoculation groups.

Isolation and study of cultures of Chinese vetch nodule bacteria, H. Z. GAW (*Jour. Bact., 48 (1944), No. 4, pp. 483–489*).—On the basis of nodule production on vetch the eight cultures studied are placed in the vetch group of *Rhizobium leguminosarum*. Though the culture characters were fairly uniform, considerable variation was noted as to physiological reactions among the strains. There was, however, no indication of the cultures falling into distinct groups, the variations being irregular and with no observable correlations.

Note on the root-nodule bacteria of Astragalus sinicus L., H. K. CHEN and M. K. SHU (*Soil Sci., 58 (1944), No. 4, pp. 291–293*).—This study forms the counterpart of that by Bushnell and Sarles (E. S. R., 79, p. 29), in which bacteria isolated from *Astragalus* spp. were tested on plants of known cross-inoculation groups. The results agreed in that root-nodule bacteria of *Astragalus* did not produce nodules on other legume genera, nor did bacteria from other sources (except *Desmodium heterophyllum*) form nodules on *Astragalus*. Since it is known that bacteria of the cowpea group often infect plants of different groups, the nodulation of *A. sinicus* by *D. heterophyllum* bacteria is not believed to invalidate the conclusion that *Astragalus* and its root-nodule bacteria must be considered a select cross-inoculation group.

Effects of snowbrush on the growth of Sierra gooseberry, C. R. Quick. (U. S. D. A.). (*Jour. Forestry, 42 (1944), No. 11, pp. 827–832, illus. 2*).—Root tubercles closely resembling those of the legume-nodule bacteria were observed on seven species of *Ceanothus* in the sugar pine forest of the Sierra Nevada and on one species at Berkeley, Calif. Seedlings of the snowbrush (*C. cordulatus*) and of the Sierra gooseberry (*Ribes roezli*) were grown in mixed cultures and alone in forest soil—both natural and autoclaved—with half of each lot of soil inoculated with an infusion of freshly macerated tubercles collected from the roots of snowbrush growing in the mountains. The association of the two plants proved definitely favorable to the gooseberry but detrimental to the snowbrush, and addition of the infusion significantly improved the quality of the autoclaved soil for growth of the snowbrush seedlings but did not improve the fertility of the natural forest soil. In another soil test in which the two species had been grown in pure cultures, there was a higher survival of gooseberry seedlings in the cans in which snowbrush had been grown than in those that had been used for gooseberries. An understanding of this relationship, in which snowbrush appears to act as a nurse plant for the Sierra gooseberry, is important for the blister rust control program in this area, where *R. roezli* is the chief species that must be suppressed to protect sugar pine.

Effects of fluorescein and Photosensin on growth of red kidney beans, R. K. Zuck. (U. S. D. A.). (*Bot. Gaz., 106 (1944), No. 1, pp. 124–129*).—Red kidney beans were grown in pure quartz sand with nutrient solution to which were added in separate series Photosensin and its constituents—fluorescein, iron sulfate, sodium bicarbonate, and copper sulfate. There were no pronounced visible differences among the living plants, and the dry-weight differences were small; plants receiving the small amount of $CuSO_4$ weighed the most. Fluorescein apparently does not stimulate growth of this plant. The so-called stunting effect hitherto ascribed to the high concentrations of fluorescein is shown to be actual killing by the extensive amounts of $NaHCO_3$ used to keep the fluorescein in solution.

Development of resistance to pyrithiamine in yeast and some observations on its nature, D. W. Woolley (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 179–180*).—A strain of *Endomyces vernalis* obtained by growing the yeast in media containing pyrithiamine was not affected in growth by concentrations 25 times greater than that required to inhibit the parent strain half-maximally. The new strain still required thiamine or its pyrimidine portion as a growth factor. In the absence of thiamine, pyrithiamine was 50 percent as active as the vitamine for growth of the variant. When grown in low concentrations of pyrithiamine and in the absence of thiamine, the new strain converted half of the pyrithiamine to the pyrimidine portion of thiamine.

Relationship of iron nutrition to the synthesis of vitamins by Torulopsis utilis, J. C. Lewis. (U. S. D. A.). (*Arch. Biochem., 4 (1944), No. 2, pp. 217–228*).—Among 10 growth factors of the vitamin B complex studied, the synthesis of 9 by *T. utilis* was significantly affected by its Fe nutrition. Fe deficiency was accompanied by increased rates of synthesis per gram of yeast for thiamine, riboflavin, niacin, pyridoxine, and pyridoxine isotels, and by decreased rates for biotin, inositol, *p*-aminobenzoic acid, and Norit eluate factor isotels. Grown in the presence of a concentration of Fe sufficient to cause a limited repression of growth, the yeast gave increased synthesis rates for riboflavin and Norit eluate factor isotels and decreased rates for biotin and inositol; no effects on pantothenic acid synthesis were demonstrated. Responses were of differing magnitudes; a very striking effect was observed with *p*-aminobenzoic acid, its synthesis amounting to about 3γ per gram of Fe-deficient yeast as compared with about 60γ per gram under an adequate supply of Fe. It is concluded that studies of mineral nutrition offer considerable promise in the search for factors influencing the microbiological syntheses of vitamins. There are 29 references.

Vitamin K in unicellular photosynthesizing organisms, H. Dam (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 492–493*).—The green alga *Chlorella vulgaris* was found to have a vitamin K activity corresponding to 6 µg. of menadione per gram of dry weight. The vitamin K activity of four photosynthesizing bacteria tested was about 0.4 to 1 expressed in the same terms. Menadione stopped photosynthesis after 24 hr. when a substantial amount was left in contact with *Chlorella;* dicumarol had no effect on photosynthesis or growth under the experimental conditions.

Function of plant vacuoles, S. R. Bose (*Nature [London], 154 (1944), No. 3911, pp. 488–489*).—In a preliminary note, the author presents evidence from two sources that pinkish vacuoles are receptacles of enzymes, viz, by synthesis and phasmolysis experiments in some fungi.

The relation of embryo axis weights to heterosis, J. Shafer, Jr. (Cornell Univ.). (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 503–506, illus. 2*).—The correlation of embryo axis weights with final dry weight or with entire embryo weights of corn was not found to be close. Some hybrids showed heterosis in spite of having embryo axes no heavier than those of their parents, and some grew at a much faster rate than either parent. The dry weights of corn plants as determined in mid-July, appeared to be rather closely correlated with final dry weights.

A study of conditions that affect the germination of Scirpus seeds, D. Isely (*[New York] Cornell Sta. Mem. 257 (1944), pp. 28, illus. 1*).—On the basis of experimentation with seeds of 14 species of *Scirpus* germinated in water at laboratory temperatures and without increased illumination, it was found that seed lots previously stored in water at 2°–4° C. gave variable germination, depending on the species; good results were obtained with small-fruited species, but not with forms having large achenes. Seeds previously stratified at low temperature in peat moss, sphagnum, and moist sand gave somewhat better results but essentially similar to those stored in water. Seed lots stored dry at room temperature or at 2°–4°, or in water at room temperature, failed to germinate. Those germinated under increased illumination (750-w. lamp) and temperatures of 30°–32° behaved as follows: Nearly all species gave fair to excellent germination after storage in water at 2°–4°; seeds stratified at low temperature in peat moss, sphagnum, and moist sand likewise gave germination as good as, or sometimes better than, those previously stored in water; seeds stored dry and in water at room temperature exhibited sporadic germination.

An increase of either illumination or temperature over laboratory conditions did not appear effective in materially raising the germination, as compared with the combined stimulatory effect. Seeds germinated in darkness, regardless of other conditions, gave very unfavorable results. Seeds frozen in ice over a long period of time showed a better seedling production than did those stored in water. Increase of oxygen in the germinating medium did not improve germination. Use of H_2SO_4 or mechanical scarification to aid germination proved unsatisfactory. Drying before or after low-temperature storage in water did not seem to affect germinative ability. Many species appeared to have an extended period of viability. Excised embryos of seeds 6 mo. after harvest were incapable of growth. Stratification at low temperature furnished the most favorable conditions for afterripening of the embryos. Seeds thus stratified and not germinating failed to do so because of a second inhibitory factor, possibly the mechanical resistance of the pericarp; exposure to increased light and temperature appeared to aid in overcoming this factor.

Growth of Corallorhiza maculata, D. T. MacDougal and H. S. Reed. (Univ. Calif. et al.). (*Science, 100 (1944), No. 2606, pp. 525–526, illus. 1*).—A note on studies of the unbranched scapes of this orchid, affording an opportunity to observe some growth phenomena "not readily discernible in other plants."

Selenium accumulation by corn as influenced by plant extracts, S. F. Trelease and A. A. Di Somma (*Amer. Jour. Bot., 31 (1944), No. 9, pp. 544–550, illus. 5*).—Seedlings grown in sand cultures receiving continuously renewed nutrient solution absorbed and accumulated 5–14 times as much Se from organic compounds in a water extract of seleniferous *Astragalus bisulcatus* as from a Na_2SeO_3 solution of equal Se concentration. A marked increase in the accumulation of Se from Na_2SeO_3 was induced by adding extract of dried nonseleniferous string beans to the solution. Furthermore, an extract of nearly nonseleniferous *A. bisulcatus* greatly increased the accumulation of Se from Na_2SeO_3 solution. The net effect of adding nonseleniferous plant extract to a culture solution containing Na_2SeO_3 was the result of two opposite influences, viz, the protective action against Se toxicity and the toxic effect of substances in the extract. *Astragalus* extract promoted Se accumulation by providing readily available organic Se compounds and by supplying nonseleniferous constituents that increased the absorption of inorganic Se. An excess of nonseleniferous *Astragalus* extract reduced both the growth of corn plants and their accumulation of Se from organic compounds in the extract. Although the possibility of bacterial activity was not excluded, there was no evidence that this played an important role in the results.

Diurnal fluctuation in a physical property of leaf cuticle, G. E. Fogg (*Nature [London], 154 (1944), No. 3912, p. 515, illus. 1*).—Measurements at intervals over periods up to 26 hr. have shown the existence of distinct diurnal fluctuations in the magnitude of the advancing contact angle of water on the leaves of *Brassica sinapsis* and *Triticum vulgare.* The contact angle of water on wilted or turgid leave stretched uniformly was found in this study not to differ appreciably from that on similar unstretched leaves. It is thus deemed unlikely that the observed changes in surface properties of the cuticle can be due simply to alteration in the closeness of packing of hydrophilic or hydrophobic units produced by expansion or contraction from turgor changes. Variation in the extent of water imbibition of the cuticle is possibly more important in determining the magnitude of contact angle.

Diurnal variations of sugars in the leaves of rice, P. K. Sen, J. K. Choudhury, and E. A. R. Banerjee (*Calcutta Univ. Jour. Dept. Sci., n. ser., 1 (1944), No. 4, pp. 1–24, illus. 8*).—Early morning, noon, and evening variations in the sugar content of the successive leaves on the main shoot were determined at three growth stages of the rice plant; some data on water content and leaf area were also ascertained. Sucrose constituted the major sugar in the leaves, and the diurnal variations were due mainly to this constituent. Reducing sugar was present in only small proportions, though it showed a significant rise during the day. The amounts of sugar accumulated between morning and noon and between noon and evening differed but little. The assimilatory rate appeared to fall with time, but to rise somewhat about the flowering stage. The morning values for sucrose content of the leaves increased with time, the minimum being at the early stage of active tillering.

Alkaloid accumulation in reciprocal grafts of Datura stramonium with tobacco and tomato, S. M. Peacock, Jr., D. B. Leyerle, and R. F. Dawson. (Univ. Mo. et al.). (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 463–466*).—In this study of the accumulation of mydriatic alkaloids, pupillary dilations were obtained with appropriate extracts of tobacco and tomato scions grown on *Datura* stocks; scions of *Datura* did not, as a rule, yield extracts possessing mydriatic activity. *Datura* scions grown on tobacco roots contained appreciable amounts of nicotine; for this reason the presence of atropinelike alkaloids in these scions could not be readily established. A large-scale extraction of *Datura* scions grown on tomato roots failed to yield even traces of alkaloids; a similar extraction of tomato scions grown on *Datura* roots yielded 0.12 percent of the dry weight as a crude alkaloid complex from which pure hyoscyamine was isolated. Alkaloids were detected in the sap bled from stumps of decapitated *Datura* plants. On the basis of these and other data, it is concluded that alkaloid synthesis in *D. stramonium* is confined principally to the root system of the intact plant.

Physical activities and respiration in slime molds, W. Seifriz and F. Urbach (*Growth, 8 (1944), No. 3, pp. 221–233, illus. 4*).—A method of studying and measuring the rate of spreading of myxomycete (*Physarum polycephalum*) plasmodia is described by which normal spreading gave a straight line graph, indicating that this process goes out from one or a few localized centers. At very low O_2 tension all spreading or increase in area was inhibited, though streaming was not affected. Ethlene increased the rate of both growth and spreading in all concentrations up to 85 percent.

The importance of oxygen in the nutrient substrate for plants—organic acid, L. P. Pepkowitz, S. G. Gilbert, and J. W. Shive. (N. J. Expt. Stas.). (*Soil Sci., 58 (1944), No. 4, pp. 295–303, illus. 4*).—When oats plants were grown at varying O_2 tensions of nutrient substrates, with and without a N supply in the form of nitrates, the yields of total organic acids were invariably higher at low than at high O_2 levels and in the plus- than in the corresponding minus-nitrate substrates. The latter result can only be ascribed to the presence of the nitrate ion. The yield of malic acid was higher in the plus- than in the corresponding minus-nitrate cultures, but the O_2 levels of the substrate were without significant effect on its production in plants of the plus-nitrate cultures. The malic acid content of the minus-nitrate plants, however, was lower at the low than at the high O_2 levels—a relationship directly opposite to that shown for all the other organic acids considered, including the unknown. Oxalic acid production depended largely on the presence of the nitrate ion and was inversely related to the O_2 tension of the substrate. The carbonyl acids —determined as a group—were the only ones for which higher values were shown for minus- than for corresponding plus-nitrate plants. There are 20 references.

The influence of some respiratory inhibitors and intermediates on growth and respiration of excised tomato roots, J. H. M. Henderson and J. F. Stauffer. (Univ. Wis.). (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 528–535, illus. 4*).—The excised root tips were grown in a mineral nutrient solution containing sucrose and vitamins B_1, B_6, and niacin; no growth occurred when fumarate, succinate, malate, pyruvate, citrate, or oxalacetate were substituted for sucrose. A series of substances proposed as respiratory intermediates were used in studying the rate of O_2 uptake by young tomato roots; these substances—fumarate, malate, succinate, citrate, oxalacetate, and pyruvate—produced the most consistent and accelerating rates of O_2 uptake at 0.001 M concentration; oxalacetate and pyruvate at 0.1 M inhibited the O_2 uptake strongly. Fumarate, malate, and succinate in combination tended to maintain the respiratory rate and even to accelerate it slightly. A series of experiments was carried out with malonate, fluoride, azide, cyanide, and iodoacetate as enzyme inhibitors. The results indicated that there was no malonate-sensitive system in young tomato roots; the same was true for fluoride. There was an azide- and cyanide-sensitivity suggesting the cytochrome system. The findings very definitely indicated the presence of an iodoacetate-sensitive system. In general, it was impossible to restore the rate of O_2 uptake of inhibited roots by adding a single intermediate or a combination thereof. The data suggest that a modified Krebs "tricarboxylic acid cycle" may function in the respiration of intact tomato roots.

Studies in the physiology of the onion plant, I, II (*Ann. Appl. Biol., 30 (1943), No. 4, pp. 308–319, illus. 7; 31 (1944), No. 3, pp. 173–186, illus. 4*).—

I. *An investigation of factors concerned in the flowering ('bolting') of onions grown from sets and its prevention: Part 2, Effects of day length and temperature on onions grown from sets, and general discussion,* O. V. S. Heath.—This completes the survey (E. S. R., 91, p. 288) of the effects of five factors on flowering behavior, bulbing, and ripening of onions grown from sets. Long days (16 hr.) throughout the second season inhibited inflorescence emergence irrespective of temperature within the range used. Conditions of day length and temperature in the second season favorable to bulbing proved inimical to flowering. Thus both long days and high temperature tend to encourage bulbing and prevent bolting; short days inhibit bulbing but allow bolting if the temperature is not too high. Late planting of sets in the field therefore reduces bolting. Leaf emergence ceased abruptly when bulbing began at high temperature, and even at low temperature few if any more leaves expanded. Seedlings appear to need a longer photoperiod for bulbing than plants grown from sets. A day length just adequate for bulbing at high temperature will not allow bulbing at low temperature, with the result that seedlings sown very late produce good bulbs at high temperature but may fail to bulb at low temperatures. High-temperature storage tends to produce distorted leaves; such plants show a high mortality. Heat storage also delays and restricts bulbing, which is reflected in the increased number of expanded leaves. Ripening is similarly delayed; this effect is not directly due to water loss during storage.

II. *Inflorescence initiation and development, and other changes in the internal morphology of onion sets, as influenced by temperature and day length,* O. V. S. Heath and P. B. Mathur.—The previously recorded effects on flowering of high and low temperatures were confirmed and further elucidated by data from dissections, which showed the changes at the growing point. Thus high temperature throughout the first season's growth from seed to set exerted an aftereffect, preventing initiation of inflorescences the following spring. High temperature for the first 8 of the 22 weeks' storage period produced a similar aftereffect in delaying and greatly reducing inflorescence initiation; here there was no question of a size effect involved. High temperatures throughout the 22 weeks not only prevented such initiation during treatment, but also practically inhibited it subsequently; when given during the latter part of storage only, it at least delayed initiation. High temperature during growth from set to mature onion showed a direct effect in suppressing the emergence of inflorescences already initiated in the sets, apart from the effect of bulbing. Inflorescences prevented from emerging were displaced by the axillary bud, which carried on the further development. Low temperature for the first 8 weeks of storage exerted an aftereffect in reducing the incidence of inflorescence initiation. Under cold storage for the whole 22 weeks or the last 8 weeks only, initiation was prevented during treatment, but whereas in the former case subsequent initiation was greatly reduced, in the latter a rapid initiation occurred on return of the sets to normal temperature.

The effects of high- and low-storage temperatures on formation of new leaf initials were mainly direct; the only aftereffect was a tendency for sets from the treatments preventing leaf initiation to produce initials more rapidly on return to normal temperatures. Sets produced at low temperatures were prevented from forming leaf initials by continuous high-temperature storage and those produced at high temperature by continuous cold storage, suggesting some degree of acclimatization to low and high temperatures, respectively. It appears that the 1–2 leaf primordia formed at normal temperature during mid-October to mid-March are initiated mainly during the latter part of that period. The number of swollen bulb scales in an onion set was nearly constant at 3, irrespective of set size. Even the unswollen leaf initials varied little in number over a considerable range of set size, and therefore the better yields given by large sets (if they do not bolt) must be due rather to large size of parts than to high number of leaf initials ready for emergence. The size effect on flowering is likewise not connected with number of leaf initials in the sets; it may be a matter of the number of emerged leaves in the previous season. There appears to be a minimum total number (12–14) of leaves which must be initiated before an inflorescence can be formed.

Growth and development in range grasses, III, IV, C. E. Olmsted (*Bot. Gaz., 105 (1943), No. 2, pp. 165–181, illus. 6; 106 (1944), No. 1, pp. 46–74, illus. 10*).

III. *Photoperiodic responses in the genus Bouteloua.*—In this study of the series (E. S. R., 87, p. 353), lots of 100 plants each of side-oats grama, slender grama, Rothrock's grama, hairy grama, black grama, and blue grama were grown continuously for 4.5–5 mo. after germination (April 6) on photoperiods of 16, 12, and 8 hr. in the greenhouse, when reciprocal transfers were made among treatments—both with and without simultaneous clipping of the tops—and the plants were allowed to grow for another 4–6 mo. Except for blue grama from Montana, the seed source for all was southern Arizona. Growth and flowering responses indicated the strains of slender and side-oats grama (subgenus *Atheropogon*) to be "typical" short-day plants, most individuals failing to bloom on a 16-hr. photoperiod; a critical photoperiod test showed this value to lie at 14-14.5 hr. The other 4 species (subgenus *Chondrosium*) made less decisive flowering responses. The species with strains from Arizona exhibited considerable delay in blooming on the longest photoperiod; these strains should probably be regarded as short-day plants. Blue grama from Montana was more or less indeterminate, with some long-day tendencies in flowering behavior. The 5 species with strains from Arizona exhibited more or less typical short-day vegetative behavior. The total numbers of tillers, of tillers bearing inflorescences, and of crown roots were to a greater or less degree inversely correlated with length of photoperiod in most species, whereas average maximum height and dry weights of roots and tops and vigor of individual inflorescences were correlated positively with length of photoperiod. The genus is definitely sensitive to photoperiod, and its effect should be considered in interpreting growth habits of the species in nature and in selecting and breeding programs designed to develop strains more desirable for forage production or for use in artificial revegetation of overgrazed or denuded areas. There are 27 references.

IV. *Photoperiodic responses in twelve geographic strains of side-oats grama.*—Twelve strains of side-oats grama originating from Texas to North Dakota were grown for 2 yr. in greenhouses at Chicago and their responses to natural day length and to photoperiods of 9, 13, 16, and 20 hr. analyzed. Vegetative and flowering responses showed 3 strains from southern Texas and southern Arizona to consist almost entirely of intermediate or short-day plants, with an upper critical photoperiod for flowering at 14–16 hr. and with more vigorous flowering on a 13– than on a 9–hr. photoperiod. A North Dakota strain consisted largely of long-day plants with a critical photoperiod of about 14 hr. The other 8 strains (from Nebr., Okla., Kans., and N. Mex.) also included numerous long-day individuals, though the data suggested that the length of the critical photoperiod for flowering of the "late" plants lessened with decrease in latitude of origin. Many individuals of all 12 strains are probably able to flower most vigorously on photoperiods similar to those of their native environments on which they normally flower. Other responses indicated a similar nice adjustment to the range of photoperiods in the growing seasons of their native environments

Internodal elongation and height growth were increasingly suppressed on a 9-hr. photoperiod—and to a lesser extent on a 13-hr. one—with increase in latitude of origin. Development of the primary axis was more strongly correlated with strain origin and treatment than was that of the tillers and its early behavior might be a useful criterion in genetic analyses The percentage of tillers showing internodal elongation tended to be correlated inversely with latitude of origin in all series. Numbers of crown roots tended to be correlated inversely with length of photoperiod in the southern strains, whereas in the northern strains the correlation was direct. In all except the 9-hr. series, the southern strains had smaller numbers of roots than most of the other strains under comparable treatment. Rhizomes were not produced by the southern strains. Dry weights of clipped tops were directly correlated with length of photoperiod in any one strain and more or less inversely with latitude of origin among strains.

These data show definitely that a widely ranging native species may be so differentiated in its photoperiodic requirements that its assignment to a particular photoperiodic class may be generally invalid unless based on material from a wide latitudinal range. In view of these findings, plant breeders might be aided by use of artificial photoperiodic control in their programs. The significance of the results with respect to plant geography and evolution are discussed. There are 36 references.

Zonal structure of the shoot apex in Encephalartos, Bowenia, and Macrozamia, M. A. Johnson. (Rutgers Univ.). (*Bot. Gaz., 106 (1944), No. 1, pp. 26–33, illus. 9*).—A preliminary morphological study of these members of the Cycadaceae.

Varying structure of conifer leaves in different habitats, E. L. Stover (*Bot. Gaz., 106 (1944), No. 1, pp. 12–25, illus. 25*).—In the mesic habitats of the two altitudes in the Medicine Bow Mountains investigated, the needles of *Abies lasiocarpa* were the longest, widest, and thinnest; those of *Picea engelmanni,* longest with the smallest cross section; and those of *Pinus contorta,* larger in all dimensions than those of the xeric habitats of the Laramie Range—both in Wyoming. Cuticle thickness increased with age of leaf, being thickest in the xeric habitats and in the bright sunlight of the alpine habitat; epidermal cell-wall thickness varied in the same way. Stomatal pits tended to be deeper in the older leaves and in those from xeric habitats on the fir and spruce; there was little variation in their depth on the pine. The number of cells in the hypodermal sclerenchyma was greater in older leaves, and the largest number was found in leaves from xeric habitats. The mesophyll cells in all three species were more compact in the older leaves and most so (and with smallest intercellular spaces) in leaves of trees from xeric habitats. There was an increase in vein size and in number of cells of the veins in each species by cambial growth—the greatest increase in cell number being in the phloem. Most cambial growth occurred in the pine. The oldest leaves were found on trees growing on the mesic habitats; the oldest needles, on the windblown trees of the high alpine flats and on their lee side.

Morphology of the rice spikelet, V. Michaud (*Bul. Torrey Bot. Club, 71 (1944), No. 6, pp. 624–626, illus. 3*).

The vascular structure of the leaf of Gleichenia.—II, The petiolar bundle, M. A. Chrysler. (Rutgers Univ.). (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 483–491, illus. 25*).—A continuation (E. S. R., 90, p. 465).

Studies of development in larkspur.—I, Form sequence in the first ten mature leaves, S. W. Brown. (Univ. Ga.). (*Bot. Gaz., 106 (1944), No. 1. pp. 103–108, illus. 6*).—Mature leaves of larkspur were found to bear a relationship to one another typical of growth sequences in single organs; details of the study are presented, and the use of homologous organ series in problems of relative growth and the use of relative growth technics in estimating degree of differentiation are discussed.

Periclinal chimeras in Datura in relation to the development of the carpel, S. SATINA and A. F. BLAKESLEE (*Amer. Jour. Bot., 30 (1943), No. 7, pp. 453–462, illus. 31*).

Periclinal chimeras in Datura in relation to development and structure (A) of the style and stigma (B) of calyx and corolla, S. SATINA (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 493–502, illus. 33*).—A detailed account of the differentiation and structure of the style and stigma and of the role of epidermal cells in the formation of the calyx and corolla.

Development and structure of Bromus inermis Leyss, I. W. KNOBLOCH. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 19 (1944), No. 1, pp. 67–98, illus. 29*).—A detailed study is presented of the gross morphology, anatomy, and development of smooth bromegrass. There are 77 references.

Embryology of Paspalum dilatatum, H. W. BENNETT. (Miss. Expt. Sta.). (*Bot. Gaz., 106 (1944), No. 1, pp. 40–45, illus. 15*).—The increasing importance of Dallis grass as a pasture plant was believed to warrant this more detailed study of its cytology, morphology, and life history. The time interval between pollination and fertilization under average summer conditions was found to be 8–12 hr. The endosperm nuclei were free for the first 2 days, and there was no consistent arrangement or zonation of cells in the young embryo. Initiation of the coleoptile-radicle axis began in 60–72 hr. Development of the embryo was extremely rapid from the fourth to the eighth days and was structurally complete in 14–18 days. The mature embryo had one foliage leaf and a distinct radicle with root cap. There was no epiblast.

Cytological evidence for the taxonomic position of Schizachne purpurascens, W. S. BOYLE. (Univ. Calif.). (*Madroño, 7 (1944), No. 5, pp. 129–130, illus. 1*).—On this monotypic genus of the grass family.

A general cytohistological study of colchicine polyploidy in cranberry, H. DERMEN and H. F. BAIN. (U. S. D. A.). (*Amer. Jour. Bot., 31 (1944), No. 8, pp. 451–463, illus. 36*).—By technics described, studies were made of the cytohistological changes induced in cranberry by colchicine treatment. The stem apexes in lateral buds and growing tips of runner branches were found to be composed of three primary histogenic layers; these tissues were seldom changed totally into a polyploid condition by colchicine. In a large proportion of cases polyploidy was confined to a sector, thus forming a cytochimera. An internally or totally polyploid sector was recognized by the occurrence along a branch of wider-than-normal leaves interspersed at certain intervals with normal leaves. Epidermal polyploidy alone was recognizd by enlarged stomata on normal-sized leaves; internal polyploidy alone, by larger-than-normal leaves with normal-sized stomata. The isolation and propagation of a polyploid form contained in a sector was accomplished by cutting back the branch to a leaf characterizing this form and forcing into growth the bud at the axil of that leaf; the runner branches resulting from such growth were then rooted and grown separately. Internally and totally polyploid plants had visibly larger leaves, thicker stems, and larger flowers and fruits than normal or epidermal polyploid pants. Seeds of the internal tetraploids appeared to be about the same size as those of the epidermal tetaploids, and seeds of the total tetraploids were larger than those of the other cytological forms. Seeds of the epidermal polypoids were larger than those of the diploid mother plants. Other parts and organs of the epidermal polyploids did not vary in size or shape in any appreciable degree from those of diploids. Polyploidy seems to bring about principally the enlargement of cells in the polyploidized internal tissues of the stem without increasing the cell number in the internal tissues, whereas cell number in the epidermis is affected both by polyploidy and by cytological constitution of the underlying tissues. The findings emphasize that special propagation as well as treatment technics must be employed to obtain polyploid forms from cochicine-treated material of such a semiwoody plant as cranberry, and presumably also in other semiwoody and woody plants.

Sectorial polyploidy and phyllotaxy in the cranberry (Vaccinium macrocarpon Ait.), H. F. BAIN and H. DERMEN. (U. S. D. A.). (*Amer. Jour. Bot., 31 (1944), No. 9, pp. 581–587, illus. 7*).—In this study, involving mathematical and anatomical analyses of the relations between phyllotaxy and polyploid sectors induced by colchicine, cranberry runner branches are shown to have had the 5/13 phyllotactic arrangement in the material employed. The succession orders in which sectorial leaves occurred along stems with this arrangement are worked out mathematically and illustrated by examples obtained in colchicine-treated runners. It is suggested that polyploid-sector analysis should provide a useful method for investigating the structure of growing stem tips.

The cytological effects of benzene vapor, C. A. BERGER, E. R. WITKUS, and B. J. SULLIVAN (*Bul. Torrey Bot. Club, 71 (1944), No. 6, pp. 620–623, illus. 9*).—As tried on the onion, benzene and its vapor produced cytological effects similar to those by colchicine. Spindle formation was inhibited and division of the spindle attachment region was delayed. Diplochromosomes were formed and tetraploid cells resulted. In the root tip divisions chromatids were widely separated and half-chromatids became clearly visible at prometaphase.

Experimental studies on the cytology of Allium, C. A. BERGER (*Biol. Bul., 87 (1944), No. 2, p. 163*).—An abstract. The cytological effects of a number of chemical agents on onion root tips were studied.

An investigation of the presence of siliceous rods in the secondary wall of woody tissue, W. M. SCHALL. (Univ. Calif.). (*Madroño, 7 (1943), No. 1, pp. 8–14, illus. 1*).—Silica was not found present in the form of continuous siliceous skeletons in the secondary wall of woody tissue. The Si content was so small as compared to the total weight of the wood that it could have no appreciable effect—greater than other minerals—on the differential swelling or shrinking of wood. Other than bringing about more rapid degradation of the wood substance, HF is similar to HCl in its action on the cell wall.

GENETICS

Heredity, development, and infection, C. D. DARLINGTON (*Nature [London], 154 (1944), No. 3901, pp. 164–169, illus. 3*).—This theoretical contribution discusses the three levels of heredity, viz, (1) that most accurately and equally transmitted by the two parents and responsible for mendelian heredity of genes, (2) the plastid or corpuscular system, recognizable only in green plants and always unequal in inheritance, and (3) the undefined residue of heredity—the cytoplasmic or molecular system, which must depend on chemical rather than mechanical or even physiological equilibrium for its continuance. On these bases, consideration is given to the plastogenes, plasmagenes, differentiation and mutation, infection and heredity, and molecular origins. On the one hand there are postulated some proteins put together by the nucleus with the aid of desoxyribose nucleic acid. Perhaps the larger types of proteins arise from the euchromatic genes, the smaller from the heterochromatic—the latter characterized by the repetition of similar and doubtless simple elements, making them more like plasmagenes. The euchromatic genes would act by the integrated effects of dissimilar elements producing complex proteins. Those from the nucleus need not be self-reproducing; there are also other proteins, plasmagenes, and viruses, formed in the cytoplasm only from preexisting proteins of similar types.

These molecular types depend for their reproduction on ribose nucleic acid and are conditionally self-perpetuating, but their relative quantities are under cell control and they depend on the interaction of nucleus and cytoplasm, varying with this interaction both in heredity and development. Between these two extremes of protein formation there are intermediate conditions where proteins, although formed by the nucleus, are potentially self-perpetuating. At the molecular level, heredity, development, and infection are under nuclear and environal control, and this control operates in production and reproduction, in action, in distribution, and in mutation. Further, there is interaction and adaptation at this molecular level and between it and the higher levels. Owing to this capacity for adaptation, there is a common reservoir from which the new material of heredity and infection is continually being drawn. "The frontiers that exist between the studies of heredity, development, and infection are thus technical and arbitrary, and new possibilities of analysis and experiment will arise when we have learnt the passwords to take us across them." There are 37 references.

Paracrinkle virus and inheritance, G. P. CARSON, H. W. HOWARD, R. MARKHAM, and K. M. SMITH (*Nature [London], 154 (1944), No. 3906, p. 334*).—A brief critique on the article by Darlington noted above, relative to the origin of viruses and particularly that of paracrinkle virus in the potato variety King Edward.

Heredity, development, and infection, J. B. S. HALDANE (*Nature [London], 154 (1944), No. 3909, p. 429*).—A brief note on the paper noted above.

Paracrinkle virus and inheritance, C. D. DARLINGTON (*Nature [London], 154 (1944), No. 3911, p. 489*).—A reply to criticism of the paper by Darlington noted above.

Growth hormone studies of some diploid and autotetraploid plants, F. G. GUSTAFSON (*Jour. Hered., 35 (1944), No. 9, pp. 269–272, illus. 1*).—In this study the autotetraploid marigold (*Tagetes*) Guinea Gold had 58.1 percent as much growth hormone as the diploid, that of the marigold Golden West 76.3 as much as the diploid, and that of *Lycopersicum pimpinellifolium* 56.84 percent as much as the diploid.

Growth changes in maize endosperm associated with the relocation of chromosome parts, D. F. JONES. (Conn. [New Haven] Expt. Sta.). (*Genetics, 29 (1944), No. 5, pp. 420–427, illus. 2*).—Outgrowths of the surface of mature corn seeds (E. S. R., p. 78, p. 468; 83, p. 324) are associated with breakage and relocation of chromosome parts. Use of gene markers of the long arm of chromosome 5 showed that somewhere between *Bt* and *Pr* growth-activating regions exist which are stimulated to increased growth, presumably when brought into close contact with other regions of the chromosomes normally kept separate.

Medicine men and the preservation of a relict gene in maize, H. C. CUTLER (*Jour. Hered., 35 (1944), No. 10, pp. 290–294, illus. 4*).—It is suggested that the use of pod or tunicate corn (an undesirable dominant) by Indian medicine men, especially in southwestern United States and Central and South America, may have served to perpetuate and distribute it widely.

The sources of effective germ-plasm in hybrid maize, E. ANDERSON (*Ann. Missouri Bot. Gard., 31 (1944), No. 4, pp. 355–361*).—Attempts were made to determine which open-pollinated varieties of corn have contributed most germplasm to modern four-way hydrids. For central Iowa one group of highly successful hybrids was made up wholly of inbreds from Reid, Krug, and Lancaster Surecropper. Evidence for the particular excellence of Lancaster Surecropper as a source of hybrid germ-plasm is given. Its history was obtained from Isaac Hershey, one of the originators, and his methods of selection are described. Possibly advantages of selecting simultaneously for performance and morphological diversity and the need of more exact information on population structure in corn are discussed. For the sake of understanding and improving modern hybrid corn, breeding structure of representative open-pollinated varieties evidently must be investigated.

Two collections of prehistoric corn tassels from southern Utah, E. ANDERSON (*Ann. Missouri Bot. Gard., 31 (1944), No. 4, pp. 345–353, illus. 5*).

Oppositional alleles in natural populations of Trifolium repens, S. S. ATWOOD. (U. S. D. A.). (*Genetics, 29 (1944), No. 5, pp. 428–435*).—In each of two natural populations of white clover, 49 plants were sampled for a study of frequency of oppositional allels. All 98 plants proved self-incompatible and all cross-compatible with a plant homozygous for oppositional allels. Incompatible matings among diallel crosses between 49 F_1 plants within each series indicated that the two unknown allels being tested were identical. In the first series, 36 of the 49 allels were different, resulting in 1.53 percent of the matings being incompatible, and in the second, 39 were different, resulting in only 0.94 percent of incompatible crosses. Highly significant differences between plants within each series were found as to number of seeds per 10 flowers following compatible crosses. A case of a white clover plant highly male sterile due to other than morphological causes is described. See also earlier notes on compatibility in *T. repens* (E. S. R., 87, pp. 652, 787; 88, p. 748).

Cytological observations on Tripsacum dactyloides, E. ANDERSON (*Ann. Missouri Bot. Gard., 31 (1944), No. 4, pp. 317–323, illus. 2*).—Chromosome counts are reported for *T. dactyloides* collected at various points throughout its range. In the prairies and Great Plains it has 18 pairs of chromosomes and along the eastern seaboard 36, and in Texas both 18 and 36 pairs have been reported. The 18-paired plants undergo regular meiosis with no multivalent associations. Those with 72 chromosomes averaged 6 quadrivalents and 24 bivalents. On the basis of these observations and the general morphology of *T. dactyloides,* it is suggested that the 18-paired varieties of *Tripsacum* may be amphidiploids of the formula XXYY and that the 36-paired varieties arose as octoploids (XXYYXXZZ) between XXYY and XXZZ varieties.

Meiotic studies of crosses between Fragaria ovalis and X. F. ananassa, L. POWERS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 11, pp. 435–448*).—In connection with a breeding program to develop varieties of strawberries adapted to the environmental conditions prevailing at Cheyenne, Wyo., cytological studies were made of three collections of the native Rocky Mountain strawberry *F. ovalis,* of three horticultural varieties, Fairfax, Dorsett, and Gem, and three hybrids between *F. ovalis* and the cultivated varieties. The results showed rather conclusively that meiotic instability is at the most a minor problem under the prevailing environmental conditions. The segregation of the genes differentiating certain characters, as indicated by the means of these characters for different populations, gave rather convincing evidence that allosyndesis is the rule during the meiosis of the F_4 hybrids. There appeared to be no reason why the economically important characters of the cultivated strawberry and the Rocky Mountain species cannot be recombined into a single variety adapted to the environmental conditions prevailing at Cheyenne, Wyo.

A combination of semi-sterility with two simply inherited characters that can be used to reduce the cost of hybrid tomato seed, T. M. CURRENCE. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 403–406*).—Progenies raised from a single tomato plant found in the F_2 generation of a cross between two unnamed parents, were semisterile, apparently because of unusually long styles which extended beyond the anthers prior to maturation of the pollen. However, with pollination it is possible to produce a good crop of fruit with normal seed content. The long style character is inherited simply and can be transferred by backcrossing to any desired variety to be used as a female parent of hybrid seed. When flowers of this type are cross pollinated without emasculation, a large percentage of crosses is obtained. To utilize the new character in hybrid seed production, it would be possible to use the potato leaf and green stem characters for identification purposes. A suggested technic is discussed.

The extent of hybrid vigor in F_1 and F_2 generations of tomato crosses, with particular reference to early yield, total yield, and fruit size, R. E. LARSON and T. M. CURRENCE (*Minnesota Sta. Tech. Bul. 164* (*1944*), *pp. 32*).—Experiments conducted over a period of years with named varieties and selected strains indicated that early yield is inherited intermediately in the F_1 generation with a tendency toward the larger early-yielding parent. The cumulative effect of genes for yield gives rise occasionally to a superior yielding F_1 line. The average yield increases of the F_1 and F_2 over the parental average were 39 and 23 percent, respectively. A high positive correlation of 0.739 obtained between the average yield of F_1 lines and yield of the highest-yielding selection within each respective F_2 suggested that better selections might be obtained in the F_2 from high-yielding rather than low-yielding F_1's.

The inheritance of fruit size was intermediate in the F_1 with a tendency toward the smaller-fruited parent. Large differences in fruit size between the F_1 lines and their related F_2 lines may be explained on the basis of the number of partially dominant genes for small fruit size present in the hybrid.

Observations on the response of hybrids to different spacings indicated that naturally smaller plants respond more favorably under limited spacing than do larger types. Under conditions of ample space, the larger types may mature as early as the smaller, provided their genetic factors for maturity are similar. Apparently large plant hybrids failed to develop their maximum fruit size under narrow spacing limitations. Total yields were, however, progressively increased as the spacing between plants decreased from 6 to 2 ft.

In conclusion, the authors assert that there are apparently distinct advantages to be gained in the utilization of F_1 tomato hybrids. Numerous F_1 lines matured significantly earlier than either parent and some as early as the variety Earliana, over which they had the advantage of better shape and smoothness. Several F_1 lines surpassed the highest-yielding commercial varieties under the test with respect to total yield.

Embryo culture of a tomato species hybrid, P. G. SMITH. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 44* (*1944*), *pp. 413–416, illus. 1*).—A record is presented of an attempt to obtain hybrids between *Lycopersicon esculentum* and *L. peruvianum* by the use of the embryo culture technic. From a total of 50-odd dissected embryos, 3 were cultured and attained a size suitable for transplanting into soil. In all the crosses, the cultivated tomato Michigan State Forcing was used as the ovule parent. Although normal-appearing fruits were produced, most of the seeds contained minute collapsed ovules with an occasional enlarged ovule with a partially developed embryo. Only those fruits that made rapid development on vigorous healthy plants contained these partially developed embryos. The embryos that grew developed rapidly when transferred to the nutrient medium. The plants were vigorous, and bloomed freely, but the flowers were self-sterile. No seed was produced with *L. esculentum* pollen, but in the backcross to the *L. peruvianum* parent there was obtained seed some of which contained apparently normal embryos. The project has had to be suspended for the duration of the war.

Genetic proof of heterokaryosis in Penicillium notatum, G. PONTECORVO and A. R. GEMMELL (*Nature* [*London*], *154* (*1944*), *No. 3912, pp. 514–515, illus. 1*).—In this note the author states that previous "cytological inference, in the case of *P. notatum,* needs the support of a genetic counterproof—this can now be supplied." Brief details are presented of the results of production by X-rays of mutant strains, mixed inoculations two by two of different mutant strains, and search for nonmutant ("wild type") patches or for patches differing from either strain at the center of the mixed colony and along the radii where the mycelia of the two strains contact.

Mendelian inheritance of adaptive enzymes in yeast, C. C. LINDEGREN, S. SPIEGELMAN, and G. LINDEGREN (*Natl. Acad. Sci. Proc., 30* (*1944*), *No. 11, pp.*

346–352, illus. 2).—*Saccharomyces carlsbergensis* and its haploid segregants adapted themselves to melibiose fermentation; *S. cerevisiae* and its haplophase did not Data from 175 progenies of the interspecific and related hybrids were consistent with the view that *S. carlsbergenesis* contains two pairs of dominant genes, each of which controls the production of an adaptive enzyme. The gene initiates the synthesis of a melibiose-fermenting enzyme complex, providing melibiose is present *S. cerevisiae* is homozygous for the recessive allels.

What is germ plasm? G. T. HARGITT (*Science, 100 (1944), No. 2599, pp. 343–348*).—It is contended that the term "germ plasm" has been so generally used, with diverse meanings, by laymen and biologists that a clear understanding or appreciation of the underlying molecular phenomena, which are fundamental and significant, may be prevented.

The heredity of smooth tongue, with special reference to cattle, T. DE GROOT (*Genetica ['s Gravenhage], 23 (1942), No. 2, pp. 221–246, illus. 14*).—Epitheliogenesis imperfecta linguae bovis, which has become very widespread among the cattle of the Netherlands, was found from a study of the pedigrees of 350 abnormal animals and the distribution of 90 normals to 38 smooth-tongued individuals in the F_2 generation to indicate that the defect or tendency to develop it depends on a simple autosomal recessive factor. For the most progress in ridding the herd of the abnormality, all parents of defectives should be eliminated. The similarity to the condition described by I. Lundholm[1] in man as hereditary hypochromic anemia is noted.

Prevalence of "wrytail" in cattle, F. W. ATKESON, F. ELDRIDGE, and H. L. IBSEN. (Kans. State Col.). (*Guernsey Breeders' Jour., 66 (1944), No. 8, pp. 785–787, illus. 2*).—Confirmation was given to the inheritance of wry tail (E. S. R., 74, p. 622) as a recessive character due to a gene frequency of 57.8 percent in 10 Jersey herds totaling 350 head, in which there were 117 animals with wry tails. There was practically equal distribution of wry tail to the left or to the right regardless of this characteristic in the parents of wry-tailed progeny, indicating that the direction of the tail set is nongenetic. The character has been observed in the other dairy breeds, but sufficient evidence is not available to determine if the mode of inheritance is the same as that found in the Jersey and Brown Swiss.

Can we breed up Holstein test? J. [W.] BARTLETT. (N. J. Expt. Stas.). (*Holstein-Friesian World, 41 (1944), No. 20, pp. 13–14, 115–116, illus. 2*).—Study of the development of the Holstein herd inbred for 12 yr. showed that dairy cattle may be profitably inbred but that rigid selection must be followed. Animals carrying undesirable genes may be eliminated and attention concentrated on desirable qualities for size, breed type, percentage of fat, and milk production. When the same sires were used, inbreeding raised the percentage of fat twice as fast as outbreeding without significantly modifying the milk production. This has been essentially noted (E. S. R., 91, p. 530).

Histological studies of boar testes, W. W. GREEN and L. M. WINTERS. (Minn. Expt. Sta.). (*Jour. Morphol., 75 (1944), No. 2, pp. 291–301, illus. 5*).—The rate of testicular development of boars castrated at 8–28 weeks of age was ascertained by histological studies. There were significant differences between inbred groups in the rate of increase of testicular weight and numbers of spermatogonia and primary spermatocytes and in the absolute number of spermatogonia per seminiferous tubule cross section and number and diameter of Leydig cells. There were no group differences in the diameter or rate of increase in the diameter of seminiferous tubules. It was thus evident that genetic constitution of the animal should be considered when studying testicular development. This was more closely related to body weight than age; the left testis was heavier than the right, and season of farrow possibly influenced the rate of testicular development, but these differences were not statistically significant. As line differences have been found in growth responses to castration, sexual activity of boars, time of puberty, 17-ketosteroid excretion, fertility and growth rate, red cell count, hemoglobin, and serum protein content of the blood, it is not surprising to find differences within these lines in the rate of testicular development.

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[1] Acta Med. Scand., Sup. 102 (1939), pp. 273+, illus. 1.

Lateral hermaphroditism (gynandromorphism) in a pig, C. E. Brown (*Vet. Med., 39 (1944), No. 12, pp. 456–457, illus. 2*).—A pig on autopsy was shown to have an ovary and a testicle at the end of the left and right uterine horns, respectively.

Size of vulva and its relation to fertility in foxes, C. P. Pearson and C. F. Bassett (*Amer. Fur Breeder, 17 (1944), No. 5, pp. 12, 14, illus. 4*).—The average maximum arbitrary vulva size of 115 yearling vixens was 5.42 ± 0.06, whereas with 190 adults the average was 6.60 ± 0.05. Differences between the vulva size of yearlings and 2- and 3-year-olds were significant, but differences between the second- and third-year-olds were not significant. The maximum size of the vulva of vixens was related in successive years. Rating the vulva size from 1 to 9 for each individual, there was an increase of 0.75 pup with each increase of one grade among adult vixens, and 0.45 pup with yearling vixens.

Another case of a black-blue mosaic in the Dutch rabbit, S. E. Smith. (U. S. D. A.). (*Jour. Hered., 35 (1944), No. 11, pp. 325–326, illus. 1*).—A mosaic female rabbit at the U. S. Plant, Soil, and Nutrition Laboratory was born of black Dutch parents. On breeding tests with her sire there were produced 14 progeny of which 7 were black Dutch, 1 was blue Dutch, and 6 were albinos. These results were taken to indicate that this mosaic was heterozygous for the dilution factor *i* and the color factor *c*. It is assumed that the mosaic area resulted from somatic mutation of *I* to *i*, so that the cells of that area have the *ii* genotype which in this case produced a blue color. The genetics of such rabbit mosaic has been discussed by Castle (E. S. R., 83, p. 608).

Absence of potentiation of gonadotropin and steroid function in mammals by colchicine, M. K. McPhail and K. M. Wilbur (*Endocrinology, 35 (1944), No. 3, pp. 196–197*).—No significant effect was induced by colchicine on ovulation in the rabbit or growth of the immature mouse ovary, both induced by pregnant mare serum, or on the size of the prostate gland and seminal vesicles of castrated rats injected with testosterone propionate. These results were based on 12 pairs of rabbits and 14 mice injected with pregnant mare serum and 13 mice in which saline was used in place of colchicine. The study of the seminal vesicles and prostates of castrated rats was made with 3 groups of 8 animals, 1 group of which received testosterone, another testosterone and colchicine, and a third received neither.

Alkaline phosphatase in the ovarian follicles and corpora lutea, G. W. Corner (*Science, 100 (1944), No. 2595, pp. 270–271*).—Histological study of mature follicles of sows in estrus showed that the cells of the theca interna were heavily laden with black granules, indicating the presence of phosphatase, whereas the cytoplasm of the granulosa cells was entirely free of the enzyme. This difference persisted after ovulation and during organization of the corpora lutea. On the contrary, mature follicles from a rabbit 9 hr. after mating showed a strong concentration of phosphatase in the granulosa but none in the theca interna. In corpora lutea about 8 hr., 3 days, and 5 days old, respectively, the lutein cells were laden with the enzyme. Possibly the finding of no granules is because of examining only retrogressive corpora lutea. A heavy black deposit representing phosphatase was found in the theca interna, and a light deposit of the guinea pig in estrus. There seemed to be some variation in the presence of phosphatase in human corpora lutea of different ages. In six species studied, five different conditions existed. The presence of the enzyme seemed to be related to the metabolism of fat.

Effect of thiamin deficiency and controlled inanition on ovarian function, V. A. Drill and M. W. Burrill (*Endocrinology, 35 (1944), No. 3, pp. 187–192, illus. 2*).—In two experiments, estrous cycles ceased in thiamine-deficient normal rats after 16–24 days. Similar responses were noted by other groups of rats subjected to the same feed intake but with adequate thiamine. Diminished gonadotropic function of the pituitary was assumed to be the primary cause of the ovarian hypofunction and the persistent diestrus, except in one of the seven thiamine-deficient rats in the first experiment and two of the eight in the second. There were like numbers of inanition controls in these studies.

Influence of reproductive hormones upon growth in ovariectomized and normal female rats, R. Bogart, J. F. Lasley, and D. T. Mayer. (Mo. Expt. Sta.). (*Endocrinology, 35 (1944), No. 3, pp. 173–181*).—The growth rate of normal and ovariectomized female rats was retarded by the injection of estrone, and the retardation was greatest in the prepubertal animals and in ovariectomized rats when growth rate was most rapid. The quantity of estrone necessary to retard growth in ovariectomized rats in proportion to that in unoperated controls was between 10 and 40 International Units per day. These amounts were within the physiological level of estrogen production of the postpubertal virgin female. Progesterone accelerated growth rate, the greatest acceleration occurring when the growth rate was at a minimum. It seemed to make no difference whether the hormone was injected or produced in pseudopregnancy or pregnancy. However, pregnancy gave a more pronounced stimulus to growth. The growth rate changes were not due to differences in the fat or water content of the carcass, indicating the part played by other factors. There were used in the study groups of 3 to 16 normal and ovariectomized prepubertal and pubertal rats. Groups of ovariectomized rats received different amounts and rates of treatments with estrone for 110 days, and the weights were ascertained at periodic intervals to 164 days. In another group females were mated with vasectomized males for study of the effects of pseudopregnancy. The effect of estrone and ovariectomy were investigated in the fat and water of the carcasses from animals subjected to autopsy.

The development of reactivity in the accessory reproductive organs of castrated and spayed rats injected with testosterone propionate, D. Price (*Physiol. Zool., 17 (1944), No. 4, pp. 377–391, illus. 6*).—The responsiveness of the gonads and accessory reproductive organs of castrated and spayed rats to exogenous hormones was found to depend on the age of the treated animals as well as on other conditions. Males and females gonadectomized at 8 days of age were injected daily for 6 days with graded doses of testosterone propionate beginning at 8, 20, 30, 50, and 70 days of age. In another series of experiments males were castrated at 20, 30, 50, or 70 days of age and injected immediately for the 6-day period as in the first experiment. The minimum effective dose for responsiveness by the male prostate at 8–13 days was 1 μg. daily, but better development occurred at more advanced age, so that the minimum effective dose was 5 μg. at 36–56 days and 10 μg. at 76 days. The responsiveness was maintained in the prostate through the seventy-sixth day, but was somewhat diminished in the seminal vesicles and uterus. As age advanced there seemed to be no change in the responsivity up to 76 days. The results were based on the weights of the seminal vesicles and on a histological study of them for animals receiving doses of 1, 5, 10, 25, 50, and 100 μg. daily for 6 days.

Antigenic differences between the sperm of different inbred strains of mice, G. D. Snell (*Science, 100 (1944), No. 2595, pp. 272–273*).—Studies of the antigenic properties of sperm samples from mice, dissected out of the vasa deferentia and epididymides from nine different inbred lines, showed that antisperm serum from one family was differentiated from other families by absorption. Results of antisperm properties from a cross of two families point to the presence of a second distinguishing antigen or antigens in the sperm of one of the inbred families.

The role of carotenols in growth and reproduction in the fowl, A. E. SCHUMACHER, H. M. SCOTT, J. S. HUGHES, and W. J. PETERSON. (Kans. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 529–532*).—Carotenoid-free chicks from hens on a carotenoid-free ration died of vitamin A deficiency at 4–5 weeks of age. The chicks grew normally when the ration was supplemented with vitamin A from cod-liver oil or provitamin A. There was no beneficial action on growth or survival from 0.3 mg. luteol or zeaxanthol per chick per day when fed alone or in combination with vitamin A or carotene. Because these carotenols rapidly destroyed vitamin A, possibly by removal of antioxidants, it was necessary to feed them by capsule or by pipette. The fertility of the eggs from 27 pullets free of carotenol, mated with males on carotenoid-free rations, dropped to about 10 percent in over 6 mo. The fertility of the eggs fertilized with semen from 17 males on carotenoid-free rations averaged 82.3 percent. Of these, the eggs fertilized by 9 males gave 100 percent fertility and the lowest fertility of any males in this lot was 50 percent. Evidently carotenols do not possess a vitamin A potency, but the results also demonstrated that carotenols are not essential for reproduction by the male.

Impairment of response to stilbestrol in the oviduct of chicks deficient in L. casei factor ("folic acid"), R. HERTZ and W. H. SEBRELL (*Science, 100 (1944), No. 2596, pp. 293–294*).—Although a marked increase in the oviduct weight of chicks occurred when stilbestrol was administered with folic acid to folic acid-deficient chicks, the increase was only slight from stilbestrol administration in the oviduct weight when no folic acid was given. The oviduct weights of normal control chicks averaged 25 mg. at 21–25 days of age, but when 10γ or 20γ of *Lactobacillus casei* factor was administered daily from birth with 0.5 mg. of stilbestrol on each of the 6 days before autopsy, the oviducts averaged 462 and 450 mg., respectively. When the same doses of stilbestrol were administered but these amounts of folic acid were given during the last 10 days before autopsy, the oviduct weights averaged 184 and 196 mg., respectively. When no folic acid or pantothenic acid was given but 10γ of stilbestrol was furnished daily, the average oviduct weights in response to daily treatments with stilbestrol were 62 and 281 mg. Pantothenic acid-deficient chicks showed a growth failure comparable to that of folic acid-deficient chicks, but there was good oviduct response to stilbestrol. An adequate intake of *L. casei* factors thus seemed essential for normal metabolism of stilbestrol in the chick. The study was conducted with 75 chicks divided into 6 lots for the different treatments.

Incidence of mortality in two strains of Single Comb White Leghorn chickens, R. L. BRYANT and E. P. JOHNSON. (Va. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, p. 521–524*).—Over a 3-yr. period there were consistent differences in the incidence of mortality in two strains of poultry. Among 2,279 chicks in the low-mortality strain there was a 4.34 percent mortality to 8 weeks of age, and 9.91 percent mortality to this age among 1,927 chicks of the high-mortality strain. From 8 to 20 weeks of age the strains showed mortality percentages from different causes of 4.64 and 7.87 percent, respectively. In deaths from all causes after 20 weeks to 525 days of age there were 25.66 and 36.34 percent. Of all the pullets housed, which totaled 1,099 and 1,021 from the low- and high-mortality lines, respectively, 2.99 and 9.06 percent died of some form of leucosis. The differences were highly significant, as well as differences between mortality from specific diseases in individual families.

Length of survival of homozygous creeper fowl embryos, W. Landauer. (Univ. Conn.). (*Science, 100 (1944), No. 2607, pp. 553–554*).—In a study of the effects of temperature of incubation lower than normal on the survival of homozygous creepers, there was no difference in the frequency of late homozygous creeper embryos when the eggs had been incubated at 96° and 99°–100° F. during the first 12 hr. When the lower temperature was extended to the first 24 hr. there was an increase of 170 percent in the frequency of survival, but when the lower temperature of incubation was employed for 48 hr. the greater survival of the creepers disappeared. When the incubation temperature was reduced to 93° for 4 days only 37 percent of the fertile eggs hatched, and when reduced for 7 days a majority of the embryos died during the second week of development. Evidently a prolonged exposure to a reduced developmental rate is harmful. The activity of the homozygous creeper conditions is thus fixed at a younger age than it has been possible to demonstrate by morphological means.

The hatchability of chicken eggs as influenced by diallel crossing, N. F. Waters. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6, pp. 495–496*).—Data were based on the hatchability of the developing embryos from 34 sires mated with 51 dams (102 degrees of freedom) divided into 17 sets consisting of 3 dams each, the sets each mated to 2 different sires. The variance analysis showed that the progeny of one sire differed significantly from that of another when both were mated to the same dams. The influence of sires on the hatchability of their progeny thus indicated the heritability of hatchability. No significant influence of the dams on the hatchability of their 2 sets of progeny was apparent.

Genotypic control of feather color pattern as demonstrated by the effects of a sex-linked gene upon the melanophores, B. H. Willier and M. E. Rawles (*Genetics, 29 (1944), No. 4, pp. 309–330, illus. 29*).—Precursor melanophores from the skin ectoderm from the head, the wing bud, or the leg bud, and pure mesoderm from the head from hybrid Rhode Island Red males × Barred Plymouth Rock females were grafted to White Leghorn embryos, both being about the same age. At all ages (66–86-hr. embryos) tested, the donor head-skin ectoderm produced pigment in the wing-down feathers. Of 107 host chicks grafted, 83 were positive and 24 negative. Melanoblasts migrated out from the grafted tissue and produced an area of black-colored down feathers on the host at about the site of grafting. After hatching, the donor-colored down feathers were replaced by contour feathers characteristic of the sex of the donor. The melanophores of the male heterozygous for the sex-linked genes B and S and the autosomal gene E^m produce a nonbarred pigmentation. The specific pigmentation produced by either the male or female melanophore depends on the individual feather germs varying with the position on the body and time of emergence. Sex seemed to have no influence on the pattern produced by grafted melanophores.

"The variations in the character of the nonbarred pigmentation produced appear to depend primarily upon differences in the expressivity of E^m in the melanophores of the various female donors—that is, whether all of the pigmented feathers of a particular host will have either (1) a uniformly black coloration almost without exception or (2) a black-red ('stippled') pattern. From such differences in phenotypic expression it is inferred that the precursor melanophores from the different female donors have different potencies—that is, either a potency for differentiating usually only black melanophores (E^m fully expressed or nearly so) or a potency for differentiating either a red or a black melanophore (expression of E^m sufficiently weakened by modifying factors). In the latter case whether the black or red potency is realized depends apparently upon the physiological properties characteristic of the individual feather germs of the host. Of these properties, the reaction gradient in the epidermal substratum, which differs in value and direction in the different feather germs, appears to play a role in the differentiation of the kind of pigment cell. Growth rate of the feather germ must also be a factor, since in general a high rate favors the formation of black melanophores while a relatively slower rate favors the formation of red melanophores. The presence of *B*, *S*, and E^m are requisite factors in the melanophore of the male hybrid for the formation of black and white barred pattern. *B* provides the melanophore with the special property of behaving rhythmically in pigment production. The rhythmic production of pigment by the melanophores, however, is modified by physiological properties characteristic of the feather germ. Growth rate of the feather germ appears to be one of the modifying factors, since in general a correlation exists between relatively slow rate and distinct barring and between relatively high rate and indistinct barring or its absence. Factors other than growth rate are also involved."

Feed influence on eye color in White Leghorn chickens, N. M. Nelson. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6. pp. 541–542*).—Significant differences were found in the eye color of 2 groups of 12 White Leghorn chickens each on high and low pigmented rations. After 141 days the eyes were removed, dried, and extracted. The photometer readings of these extracts were interpreted as indicating a significant influence of feed on eye color.

The correlation between green-grey irises and black feathers in Barred Plymouth Rock pullets, S. J. Slinger and J. J. MacIlraith (*Poultry Sci., 23 (1944), No. 6, pp. 533–537*).—Twenty Ontario breeding flocks of Barred Plymouth Rocks varying in size from 200 to 1,517 birds showed the probability of the coexistence of green-gray irises and black feathers to be much greater than the theoretical probability, thus suggesting a correlation between these conditions and that they are possibly due to the same or linked genes. The relation of the green-gray eye and all-black feathers to lymphomatosis is discussed.

An improved method of obtaining blood from the chicken heart, F. N. Andrews. (Ind. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 542–544, illus. 1*).—Entrance of the heart direct or through a cannula in which the heart has been located and successful extraction of blood maintained the sharp needles in better condition, reduced clotting and mortality, and prevented contamination of the blood sample.

Inherited shortening of the long bones in the turkey, V. S. Asmundson. (Univ. Calif.). (*Jour. Hered., 35 (1944), No. 10, pp. 295–299, illus. 2*).—A short-legged Bronze turkey hen, produced in a commercial flock, when mated to normals produced only normals. From matings of the heterozygotes there were produced in 5 yr. 590 normals and 184 short progeny, thus closely approximating a 3:1 ratio and indicating the character short long bones to be a simple recessive without significant differences in the sexes, although there were slightly more males than females. No linkage between Bronze and short was indicated in the progeny of a heterozygous short Bronze male mated with black hens, but hatchability and viability were so reduced in the shorts that only 3 percent of the short embryos were hatched and raised. Measurements of the long bones showed that the femur, tibia, tarsometatarsus, and humerus of shorts were shorter and thicker than those of normals. The relation of shank length to body weights in homozygous normals and heterozygous shorts was similar.

Cellular antigens in species and species hybrids in ducks, W. H. McGibbon. (Wis. Expt. Sta.). (*Genetics, 29 (1944), No. 5, pp. 407–419*).—Employing immunological technics of Irwin and Cole with pigeons (E. S. R., 84, p. 314), studies were made of the antigens with red cells of the Muscovy and mallard ducks and reciprocal crosses between them. Each species was found to possess specific antigens and the hybrids had most of the antigens specific to each of the parental strains as well as others which were shared by both of the parents. In addition, the hybrids were found by two methods to possess a new or hybrid substance not found in either parent. This substance was not fractionated. The hybrids from each of two matings showed differences in the antigens specific to Muscovy, which was evidently due to the segregation in the heterozygous Muscovy parents. One family of 25 hybrids from a Muscovy male possessed one or the other of two antigens, evidently controlled by one or more genes on a single pair of chromosomes. The study was based on 33 hybrid offspring from 2 Muscovy males and 5 mallard females and 39 hybrids of 3 mallard males and 5 Muscovy females.

X-rays and the reproductive cycle in ring-necked pheasants, L. B. Clark and G. Bump (*Biol. Bul., 87 (1944), No. 2, pp. 134–137, illus. 3*).—Decreased egg production and length of the laying period, with reduced viability of the eggs, followed X-ray treatments of the heads of a few pheasants.

Testicular response to androgen in the light-stimulated starling, J. W. Burger (*Endocrinology, 35 (1944), No. 3, pp. 182–186, illus. 1*).—Testosterone propionate produced no stimulating effects on spermatogenesis in the adult male starling. There was an initial depression in birds during the short-day periods. If spermatogenesis was well advanced under light stimulation, there was no effect from testosterone exogenously administered. The two experiments were conducted from February 17 to March 24 and from March 27 to April 24 when the light from natural sources changed.

FIELD CROPS

[Continuous forage grasses at Fargo] (*North Dakota Sta. Bimo. Bul., 7 (1944), No. 1, p. 26*).—T. E. Stoa reports that bromegrass alone averaged 2.20 tons per acre 1930–43 (omitting 1931), crested wheatgrass 1.98, and reed canarygrass 1.19 compared with bromegrass-alfalfa mixture 2.28 tons and alfalfa alone 1.83 tons.

The spontaneous heating of flaxseed and sunflower seed stored under adiabatic conditions, H. R. Sallans, G. D. Sinclair, and R. K. Larmour (*Canad. Jour. Res., 22 (1944), No. 6, Sect. F, pp. 181–190, illus. 4*).—Storage in an adiabatic thermostat for less than 2 mo. produced heating in flaxseed at 11.4 percent moisture and in sunflower seed at 10.5 percent, suggesting that the commercial limits of 10.5 and 9.5 percent moisture respectively are not too low. Acceleration in the over-all respiration rate of flaxseed and sunflower seed evidently precedes heating, which indicates that heating is caused by active growth of microflora on the grain and, at moisture levels in the order of those required for safe storage, normal embryonic activity is not enough to cause heating. When the relative humidity of the interstitial air in bulk grain exceeds 74 percent, microflora will grow and heating may ensue. Consequently the moisture content of any grain, in equilibrium with air at a relative humidity of 74 percent, will approximate closely the upper limit permissible for admission to "straight" grades. See earlier notes (E. S. R., 91, p. 676).

What alfalfa for Ohio in 1945? C. J. Willard and L. E. Thatcher (*Ohio Sta. Bimo. Bul. 231 (1944), pp. 261–265, illus. 3*).—Behavior of alfalfa varieties in tests indicate locally produced and other variegated alfalfas as first choice and adapted common second if the crop is to be left only 1 or 2 yr. If alfalfa is to stand 3 yr. and difficulty is had with wilt, there is little choice between common and variegated, because the greater wilt-resistance of common alfalfas nearly balances the initial advantage of variegated varieties. Ranger is suggested if wilt is on the farm and alfalfa will stand longer than 3 yr. Buffalo, when seed becomes available, is expected to surpass Ranger for at least the southern two-thirds of Ohio.

"Oklahoma Grimm" proven a fraud by tests at Columbus, C. J. Willard (*Ohio Sta. Bimo. Bul. 231 (1944), pp. 259–260*).—Tests of lots of seed sold in Ohio as Oklahoma Grimm showed that they definitely were not Grimm alfalfa.

Sutter pink beans, F. L. Smith (*California Sta., [1944], pp. 3*).—Seed of Sutter Pink, a new variety of beans derived from Standard Pink × Early Pink are larger and plumper than Early Pink, and bright colored; the vines are intermediate between the parental varieties, and it matures 3 to 7 days later than Early Pink, which it has consistently outyielded. It has the same geographical range as Early Pink and may be planted up to July 20 and harvested about October 15. In the Sacramento Valley and parts of the San Joaquin Valley, where fall rains are a hazard, it is expected to have an important place where earliness, high yields, and high quality of the seed are in demand. A wartime advantage of Sutter Pink is that bean harvest can be completed early in October. Crews, machinery, and trucks are thus released in time for harvesting rice and milo.

Effect of seed treatment on castor beans, R. O. Weibel. (Univ. Ill.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 11, pp. 953–954, illus. 1*).—Treatment of castor-bean seed with two of the newer organic fungicides evidently may be beneficial under some conditions and of little or no advantage under others.

Homologies of the ear and tassel in Zea mays, E. Anderson (*Ann. Missouri Bot. Gard., 31 (1944), No. 4, pp. 325–343, illus. 8*).—Variation in the corn tassel is described character by character, and methods of recording it exactly are outlined. Evidence is presented for ear-tassel correlations, including tassel internode condensation and increase in row number, tassel branch length and ear length, tassel branch pattern and ear shape, and tertiary branches and irregular rowing. In North American corn, the relation between tassel condensation and row number is, in general, close to the equation: Condensation index = row number /10. Tassel condensation reaches highest development in the Mexico City-Toluca area which is also the center for extreme denting. In a discussion of the problem of homologies between tassel and ear, a tentative conclusion is that in so far as the actual forces are concerned both the fused tassel branch hypothesis and the central spike hypothesis may be essentially true. Application of these facts to the genetics of quantitative characters is discussed briefly. With condensation as an example, a distinction is made between multiple factor characters which can be recorded exactly and those which may be analyzed exactly.

Maiz reventador, E. Anderson (*Ann. Missouri Bot. Gard., 31 (1944), No. 4, pp. 301–315, illus. 4*).—Maiz reventador (literally "exploder corn," i.e. popcorn), discovered by I. Kelly in western Mexico, is described as outstandingly slender in cob, leaf, and stem, with tough, strong leaves, stems, and roots. Plant color, when strongly developed, is chiefly along the veins of the leaves rather than between them. It is used locally for confections—pinole and popcorn balls. Widely, if not commonly, grown in western Mexico, its prevalence in out-of-the-way places, as well as close resemblance to the charred remains of prehistoric corn from the region, suggests that there it was once a staple crop. Several of its outstanding characteristics appear desirable in modern corn-breeding programs.

Growth status of the cotton plant as influenced by the supply of nitrogen, C. H. Wadleigh (*Arkansas Sta. Bul. 446 (1944), pp. 138, illus. 27*).—Rowden 2808 cotton plants were grown in sand culture at 8, 25, 75, and 225 p. p. m. levels of N supply, all as nitrates, and designated as series A, B, C, and D, respectively. Some plants were harvested at incipient florescence and others 40 days afterward and the rest were allowed to mature a crop of bolls.

Inception of blooming induced a lowered rate of growth in height. Absolute amount of N absorbed at incipient florescence showed an exponential relationship with amount of N supplied. Green weights of the plants at this time showed very close relationship with absolute amount of protein synthesized.

All nitrogenous components in the several parts of plants harvested when the first blooms were appearing varied with external supply, but a considerable differential existed between plant parts in expressing variability in these nitrogenous constituents. Fibrous roots showed an extreme variability in content of nitrate N. Those of series D plants contained 28 times as much as those of A. Trends in other plant fractions were high but not so extreme. Ammonium N and amides were quite low in these plants, confirming the observation that rapidly growing plants supplied with nitrate may be very low in ammonium N. α-Amino N and soluble organic N showed parallel trends in all tissues. Content was related directly to level of N supply, but main roots showed the largest range in variability of these components and fruiting branches the least. In all series, the soluble organic N content was higher in fruiting branches than in any other plant part. Nitrogenous materials were accumulating in fruiting branches at this time regardless of potential reserves. The wide range in soluble organic N in main roots was one of the better indexes of potential productivity of these plants. Carbohydrates tended to follow an inverse trend with nutrition. Except in A plants, carbohydrate reserves were relatively low. Concomitant with the wide latitude of soluble organic N observed in main roots, sucrose also showed a similar wide latitude but with the converse trend. Starch accumulation in leaves and stems appeared to be a good index of low potential production.

Trends of the several nitrogenous and carbohydrate components in vegetative parts of plants harvested 40 days after incipient florescence were similar to those observed on the plants harvested earlier, although the content of nitrogenous materials tended to be lower at the latter date. A wide latitude was noted in content of soluble N in the hulls. Hulls might act as a temporary N storage reservoir prior to translocation into developing ovules. Plants yielding poorest (A) were much the highest in carbohydrate reserves at this second sampling date also. Carbohydrates tended to accumulate in leaves and lower stems.

Plants maturing a crop of bolls averaged 27.0, 57.3, 119.8, and 143.0 gm. of seed cotton per plant for series A, B, C, and D, respectively. Fruiting charts revealed that, after a plant had set bolls enough to deplete its nitrogenous reserves, all young bolls subsequently formed abscised; and, soon thereafter, young squares abscised and terminal buds of the fruiting branches aborted. There was little relation between percentage of abscission and treatment. Abscission appears to act as a "safety valve," in that all bolls are shed which could not be developed adequately at the obtaining level of plant metabolism. Carbohydrate reserves seemed to be actually limiting for boll setting on plants with the highest level of N nutrition. No significant difference was noted in the average number of seeds produced per boll between treatments, although on A and B plants (low N) there was a marked decrease in average number of seeds per boll with advance of fruiting season and the converse trend on C and D (high N) plants. While there was no significant difference on average number of aborted embryos or motes per boll between treatments, seeds and motes per boll showed the expected inverse trends. As specific food reserves in the plant become limiting, a corresponding increase evidently results in the abortion of initiated embryos in the young bolls.

Boll size, average weight of individual seeds, and length of lint (slightly) tended to rise with increase in level of N nutrition while lint percentage tended to decrease. Protein content of seeds increased markedly with treatments conducive to increasing nitrogenous reserves within the plant. Seeds of A plants contained 17.6 percent protein and of D plants 27.0. Oil content decreased with a lowering in carbohydrate reserves as conditioned by N nutrition, the seeds from A plants averaging 29.2 percent oil and D plants 24.1. The trend for gossypol content was similar to that for oil.

A diagram shows interrelationships of certain major biochemical equilibria in the cotton plant as they relate the quality and quantity of plant product. It is considered to be economically advantageous to maintain cotton at a high level of N metabolism prior to the fruiting period, apparently because the high requirements of food reserves for developing bolls compete with roots for these reserves and thereby limit root performance as to nutrient uptake even though nutrient be plentifully available during boll maturation.

A list of 114 citations to the literature is appended.

Effect of nitrogen and phosphorus on the yield and root rot response of early and late varieties of cotton, L. M. BLANK. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 11, pp. 875–888, illus. 1*).—Effects of N and P fertilizers in combination with early and late maturing cotton varieties upon seed cotton yields and incidence of root rot were studied 1940–42 near Brenham on Houston black clay and near Caldwell on Crockett clay loam. Mean effects of N were to decrease the amount of disease by a significant or highly significant margin in 2 yr. at each location, and yields were increased significantly in all years at both locations. P had no appreciable effect upon yield or disease at Brenham, while at Caldwell both were increased in 2 yr. Early varieties as a group were as susceptible to disease as the later cottons, yet they outyielded the latter by a highly significant margin in all years at Caldwell and in 2 yr. at Brenham. See early notes by Reynolds and Rea (E. S. R., 71, p. 468) and by Adams et al. (E. S. R., 84, p. 611).

The Menominee potato: A new variety resistant to common scab and late blight, E. J. WHEELER, F. J. STEVENSON, and H. C. MOORE. (Mich. Expt. Sta. Coop. U. S. D. A.). (*Amer. Potato Jour., 21 (1944), No. 11, pp. 305–311*).—Menominee, a selection from Richter Jubel × Seedling 44537 (a russeted mutation in Chippewa × Katahdin) and first grown at Presque Isle, Maine, is described as highly resistant to scab and moderately so to late blight. Tests in Michigan showed that this late-maturing variety, if planted early, will produce relatively high yields of tubers of good cooking quality. The tubers do not cling to the vines when harvested before the plants are mature as do those of Russet Rural and Sebago. Menominee has consistently outyielded Chippewa, Russet Rural, and Sebago in bushels of U. S. No. 1 per acre at Lake City and Rogers City, Mich. Menominee is being distributed to growers in the late potato-growing sections where U. S. No. 1 potatoes of the old commercial varieties can no longer be produced because of common scab. Most of the 2,800 bu. of seed of this variety produced in 1943 was to be grown for increase in 1944.

Resin-rubber from Canadian grown plants, I, II (*Canad. Jour. Res., 22 (1944), No. 6, Sect. F, pp. 199–207, illus. 2; pp. 208–220, illus. 3*).

I. *Variation in selected genera,* R. W. Watson and N. H. Grace.—Common milkweed was selected from the most promising native genera as the only species with a resin-rubber content high enough to warrant extraction studies. Rubber is concentrated in the leaves. Drying milkweed under glass in air and full daylight at temperatures up to 60° C. has not reduced the rubber content. Concentrates are produced by fermentative decomposition. The leaf rubber content gradually increases during the growing season, with a maximum of about 3.5 percent in late September in the Ottawa district.

II. *Method of extraction from the common milkweed, Asclepias syriaca L.,* N. H. Grace, R. W. Watson and J. Klassen.—Resin-rubber gum containing about 40 percent resin, rubber 35, and residue insoluble in either acetone or benzene 25 percent, has been extracted from milkweed leaves by a method involving cooking leaves in dilute alkali, washing until the pH is reduced to about 9.5, and pebble milling to effect agglomeration. Sodium hydroxide solution (1.5 percent) boiling at atmospheric pressure has been used with cooking periods of from 2.5 to 3 hr. Gum yields about 8 percent of the weight of dried leaves have been obtained. Resin-rubber gums also have been obtained by this method from stalks and seed pod hulls of milkweed, and similar materials have been extracted from a number of other plants.

Soybean trials in Wyoming, W. L. QUAYLE (*Wyoming Sta. Bul. 267* (*1944*), *pp. 12*).—Seed and forage yields obtained in tests at several substations showed that at high elevations, the soybean varieties tried are not well adapted to the cool temperatures and short growing seasons. Under conditions like those at Torrington varieties made much better yields, but the 1940–43 average of Great Northern beans at Torrington, 42.8 bu. per acre, was 146 percent greater than the highest average yield of soybeans. Although the cost of production per acre is about the same, the average selling price of soybeans in the United States, 1931–43, was less than half that for edible beans. Under the conditions, higher yielding varieties must develop before growing soybeans as a commercial crop is warranted in this part of the State.

A study of the morphological nature and physiological functions of the awns of winter wheat, E. C. MILLER, H. G. GAUCH, and G. A. GRIES (*Kansas Sta. Tech. Bul. 57* (*1944*), *pp. 82, illus. 22*).—Plants of Kanred, Tenmarq, Early Blackhull, Turkey, Kanred × Hard Federation, Kawvale, and Fulcaster awned or bearded red winter wheats, grown in rows at Manhattan, Kans., 1935–38, were totally deawned, which involved severance with small pointed scissors of all awns of the head and beaks of the outer glumes. Others were partially deawned, i.e., with complete severance of one-half of the awns of the head. Awns were removed 4 to 7 days before, at blooming, and 7 to 14 days after.

Total and partial deawning in general decreased the weight of grain as determined from study of 100 heads. Partial deawning as a rule decreased weight of grain by about one-half that of the totally deawned. Decrease in weight of grain usually was greatest when heads were deawned before blooming. Effects of deawning tended to be less with lapse of time following deawning. Total and partial deawning generally decreased the weight of 1,000 kernels. This decrease represented about 50 to 80 percent of the decrease in yield due to deawning. Number of kernels produced by 100 heads was reduced by both types of deawning, with the more striking reductions in heads totally deawned. Deawning before blooming caused greatest reduction in number of kernels, whereas that two weeks after blooming had little or no influence on this character. No percentage increase in ash of grain followed either type of deawning.

Effects of partial deawning were also studied with Turkey and Kawvale in relation to changes in the nature of grain produced on the same head. There was always a decrease in weight of grain produced by the deawned portion of 100 heads and usually of 1,000 kernels from deawned portions of the head, as compared to the intact portions of the same heads. Decreases for 100 heads ranging from 46.48 to 4.10 percent, and for weight of 1,000 kernels, 11.15 to 2.33 percent (weighted averages), were greater the earlier heads were deawned. Fewer kernels were produced in the deawned portions than in the intact portions of the same heads. In general, number of kernels produced by deawned spikelets of Turkey was 2.5 times greater than by deawned spikelets of Kawvale, and this decrease became greater the earlier the heads were deawned. In most cases weights of glumes in both varieties were increased by both total and partial deawning. Ash content of glumes usually increased slightly as a result of deawning. Weight of the awns was not increased in the partial deawning of these heads at the deawning stages. Percentage of ash in the awns on the deawned portion of the heads always exceeded that in the controls. Deawning resulted in most cases in increase in weight of rachises and in the weight of their ash.

Response of wheat varieties to applications of superphosphate fertilizer, L. P. REITZ and H. E. MYERS. (Kans. Expt. Sta.). (*Jour. Amer. Soc. Agron.,* *36 (1944), No. 11, pp. 928–936)*.—Responses of Turkey, Tenmarq, and Quivira winter wheats 1931–38 and Kanred × Hard Federation 1936–38 to applications of superphosphate were compared on Geary silt loam at Manhattan, Kans. Phosphate applications resulted in increased yields of grain and straw, slightly higher test weight, greater percentage of yellow berry grains, reduced protein content of grain, and hastened maturity. The varieties gave significantly different yields of grain. Variety-fertilizer interaction for grain yield was significant at the 1-percent level in 1932 and at the 20-percent level in 1931 and 1935, but not significant for the entire period. Varieties of similar adaptation tend to respond in similar manner to applications of phosphate fertilizer.

Tensile strength of yucca fibers, C. W. Botkin and L. B. Shires (*New Mexico Sta. Bul. 316 (1944), pp. 30, illus. 6*).—Further studies on native fiber plants (E. S. R., 89, p. 204) dealt with strength of fiber from all abundant *Yucca* species and significant effects of extraction methods or leaf condition on fiber strength.

Yuccas were grouped as flexible-leaved, represented most abundantly by *Y. glauca and Y. elata,* and rigid or bayonet-leaved which include *Y. baccata, Y. torreyi, Y. schidigera,* and *Y. faxoniana* among abundant species. Tensile strengths in kilometers of fibers obtained from these respective species averaged 44.7, 47.5, 60.2, 61.1, 50.4, and 54.0. These strengths compare favorably with values obtained for the best commercial fibers: Palma istle 43.1, African sisal 43.0, jute 33.2, Wisconsin hemp 47.3, and Manila (abacá) 62.0 km. Yucca fiber was weakened somewhat by autoclaving at higher temperatures and by use of sodium carbonate and bisulfites of sodium and calcium at concentrations and temperatures high enough to be very effective in softening the leaves. Injury appeared to increase with ease of decortication of the leaves. Yucca fibers may be decorticated without weakening, however, by autoclaving at lower temperatures without aid of chemical reagents. Fiber is separated more readily from flexible leaves than from bayonet leaves, and extracted more easily from green than from dry leaves. Clean yucca fibers are white and lustrous. Flexible-leaf fiber, slightly finer and softer than bayonet-leaf fiber, is suited to making twine, burlap, rope, and special kinds of hard-fiber paper. Bayonet fiber is stiffer and stronger and suitable for strong rope and twine, soft brushes, and other hard-fiber uses.

HORTICULTURE

Specific gravity determination as an aid in research, W. C. Kelly and O. Smith. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 329–333*).—Although many horticultural products are adaptable to rapid specific gravity determinations, relatively few workers have used this technic. Relations between specific gravity, quality, and dry weight have been reported with the few products studied. These determinations are valuable in selecting high quality products, in selecting uniform samples, and in comparing the percentage dry weight of different lots in field and storage experiments. The specific gravity of potatoes has been studied extensively and has proved to be a valuable research tool in the study of cooking quality.

Misconceptions relative to the method of foliar diagnosis, W. Thomas and W. B. Mack. (Pa. State Col.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 355–361)*.—The authors discuss the conceptions of various agricultural investigators with respect to the diagnosis of the nutrient requirements of crop plants by means of leaf analyses. Objections to the method of foliar diagnosis are answered, and the validity of the fundamental concepts upon which this method is based is reaffirmed.

Key to common vegetables based on vegetative characters, P. G. Smith and J. H. MacGillivray. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944),* *pp. 334–338)*.—A key found useful in the classification of cultivated vegetables is presented.

Grafting in the Solanaceae, R. F. DAWSON (*Gard. Chron. Amer., 48 (1944), No. 8, pp. 235, 242, illus. 2*).—"Because of the great ease with which graft unions develop in the Solanaceae the stock-scion relationships of this group have been studied in some detail in the Princeton [University] greenhouses. Some of the results that have been obtained seem sufficiently interesting and suggestive to warrant a brief description for the benefit of gardeners in general."

Nitrogen requirements on different groups of vegetables, L. M. WARE and W. A. JOHNSON. (Ala. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 343–345*).—The yield of each type of vegetable grown on soil of the Norfolk series increased with each successively larger amount of nitrogen applied up to 120 lb. per acre, the maximum rate used. However, the relative yields of the various vegetables grown differed materially at the intermediate rates of nitrogen application. For example, the relative yield of white potatoes and sweetpotatoes at the 30 lb. of nitrogen rate was 85.9 percent of the yield with 120 lb. of nitrogen as compared with 67.7 percent for other root crops, 55.9 percent for pod-bearing crops, and 58.9 percent for leafy crops. The nitrogen responses on Decatur and Hartsell soils are discussed somewhat more briefly because of limited data.

Studies in the minor element nutrition of vegetable crop plants.—I, The interrelation of nitrogen, phosphorus, potash, and boron in the growth of rutabagas, R. H. WHITE-STEVENS and P. H. WESSELS. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 36 (1944), No. 11, pp. 903–921*).—Instances of boron (B) deficiency were noted under field conditions even when recommended applications of borax had been made. Different degrees of B deficiency were observed on susceptible crops, associated with and dependent apparently on N, P, and K fertility levels employed. N, P, and B were found to have positive main effects on growth in greenhouse experiments with rutabagas involving two levels each of N, P, K, and B. K had no main effect, but showed a positive interaction with N. B also showed a positive interaction with N. P showed a negative interaction with B. N × P × B was also a negative interaction in relation to growth. N, P, and B all promoted root growth to a greater extent than foliage growth. K and B each amplified the N effect. B, N, and P, in order given, all showed significant controlling main effects on the incidence of B-deficiency symptoms in the rutabaga. K showed a significant deleterious effect in this regard. N interacted with P to enhance the deficiency and with K and B to reduce it. P interacted with K and B to reduce deficiency. N, P, and K mutually enhanced deficiency symptoms, but P, K, and B naturally reduced them.

The effect of "split applications" of nitrogen and phosphorus on the yields of tomatoes and large seeded lima beans, E. M. EMMERT. (Ky. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 433–440*).—With tomatoes, application of 500 lb. of 20 percent superphosphate in the holes at time of setting the plants and again in four holes close to the plants, before fruit set, gave the best results. For lima beans, double drilling these same amounts at the start and before pod set gave considerably higher results than were recorded with tomatoes receiving comparable treatment. The effect of phosphorus applied in starter solutions was significantly less than in most of the other methods of application. With tomatoes, nitrogen did not show as definite results from split applications as did phosphorus. Nitrogen applications before the fruit set gave decreases and no significant increases. The only highly significant increase for nitrogen on lima beans was obtained with split applications.

The effect of sawdust on the production of tomatoes and fall potatoes and on certain soil factors affecting plant growth, W. A. JOHNSON. (Ala. Expt. Sta.).

(*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 407–412*).—Using pine sawdust 10 yr. or more of age, the author found that on a Chesterfield sandy loam soil such material can be incorporated with the soil without harmful effects if sufficient nitrogen is used to offset the resulting nitrogen depression. The effects of sawdust on yields depended on three factors (1) whether sawdust was used as a mulch or was incorporated in the soil, (2) the lapse of time following sawdust application, and (3) the amount of nitrogen applied. As a surface mulch, sawdust increased the yields the first year, caused a slight depression of nitrates the first year and a greater depression the second, increased the moisture in the soil, and resulted in a more uniform soil temperature. When incorporated in the soil, the nitrates were depressed greatly during the first 18 mo., after which they began to accumulate. The incorporated sawdust increased soil moisture and loosened the texture of the soil.

"Hormone" sprays for snap beans, A. E. Murneek, S. H. Wittwer, and D. D. Hemphill. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 428–432*).—Snap beans were sprayed with two growth-promoting substances, naphthaleneacetamide and naphthoxyacetic, at various concentrations. The relation of weather to the activity of the materials was shown in the fact that the highest increase in yield from hormone sprays was obtained in the summer of 1941 during a period of high temperature, whereas in the cool summer of 1942 there was an actual decrease in yield from spraying. Spring and fall crops of beans grown during cool weather may be harmed by these sprays. Of the concentrations used the more dilute, particularly the 5 p. p. m., were more efficient. It is believed that the beneficial effects, when occurring, are due chiefly to a direct stimulation in growth of the pods and an increase in the clorophyll content of the leaves. Fertilization and development of the embryo were apparently not affected by the materials. Because they did not overcome the unfavorable effects of weather and because of their cost, their use is not as yet recommended for general practice.

The use of sprays to set greenhouse tomatoes, R. H. Roberts and B. E. Struckmeyer. (Wis. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 417–427, illus. 9*).—Wetting the blossoms with a water solution of β-naphthoxy acetic acid or of 2, 4-dichlorophenoxy propionic acid in proper concentrations proved a practical method of setting the fruit on the lower clusters on the winter-grown tomatoes. Such treatments did not prevent the dropping of yellowish blossoms with inadequate nutrition, but was highly effective on green and persistent type flowers. Spraying very young blossoms resulted in smaller fruits. One thorough spraying of clusters of well advanced blooms gave 5–7 tomatoes of relatively uniform size. Fruits obtained by spraying were comparable to those obtained by pollination except for a greenness around the placental area. The fruits set with spray were harder to pick. The heavy drain induced by a full set of fruit must be offset by better cultural and fertilizer practices.

Further results with sprays and dusts in controlling the preharvest drop of apples, L. Southwick. (Mass. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 109–110*).—Continuing the general study (E. S. R., 90, p. 52), the author found that stop-drop dusts applied early in the morning while dew was still on the foliage and fruit were effective in decreasing the preharvest dropping of McIntosh apples. Somewhat better results were obtained with double-strength dusts and sprays and with two applications of dust or spray.

The effect of some new spray materials on the rate of apparent photosynthesis of apple leaves, S. A. Pieniazek and E. P. Christopher. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 105–106*).—Where Fermate, combined with fresh hydrated lime at the rate of 1.5 lb. of Fermate and of 1.5 lb. of hydrated lime per 100 gal. of water, was applied to Baldwin apple leaves, there was no visible injury at moderately low temperatures and only a slight reduction in carbon dioxide assimilation. Even at higher temperatures, injury was much less than with lime-sulfur. Tests were made also with a material known as Q_1 with even less injury and less effects on carbon dioxide assimilation.

Lime as a "safener" in lime sulphur and lead arsenate sprays, E. P. Christopher, S. A. Pieniazek, and C. Jennings. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 101–104*).—Studies with leaves of mature Baldwin and McIntosh apple trees failed to support the concept that lime may be used as a "safener" in combination sprays of lime-sulfur and arsenate of lead. Baldwin foliage proved more susceptible to injury than did McIntosh. In greenhouse trials, a spray of lime alone had no effect on the carbon dioxide assimilation of apple leaves. Where lime was added to a lime-sulfur and lead arsenate spray, carbon dioxide assimilation was little affected or even somewhat further reduced.

The elimination from the atmosphere of ethylene evolved by apples, R. M. Smock. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 134–140, illus. 3*).—Brominated activated carbon was the most successful agent tested for the removal of naturally evolved ethylene from the storage chamber. Bromination appeared necessary because plain activated carbon was not effective at the high relative humidities that are required in keeping apples. Although oiled paper was of some value in retarding softening induced by ripe apple vapors, it did not approach the effectiveness of the brominated carbon. Wraps impregnated with ammoniated copper fluoride were of no value and the use of ozone was of a dubious value, although in high concentrations it was of some benefit by combining with the ethylene.

The relation of leaf area per plum to physical properties and chemical composition, E. L. Overholser, C. L. Bedford, and A. L. Kenworthy. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 94–98*).—Observations on Santa Rosa and Vacaville plums showed a progressive increase in weight, size, and color of the fruit as the number of leaves per ringed branch increased from 1 to 8 leaves. It was evident that, when less than 8 leaves were available to each fruit, inadequate material was elaborated to meet the needs of both the developing fruits and potential flower buds for the succeeding crop. In the succeeding year, when leaf : fruit ratios as high as 32 : 1 were established, the Vacaville plums continued to gain in size up to 32 leaves per fruit. On the other hand, the Santa Rosa plums showed no benefit beyond 16 leaves per plum. In the first season with 8 leaves as a maximum, there was recorded an increase in the percentage of dry matter, reducing sugars, and total sugars as the number of leaves per fruit increased. In the second year with 32 leaves per plum, reducing sugars, sucrose, and total sugars on a percentage basis tended to increase in the fruits in the Santa Rosa variety up to the maximum number of leaves. The trends were not as consistent in the Vacaville variety. The acidity of the Vacaville plum tended to decrease with increase in leaves, while that of the Santa Rosa was not consistently affected by leaf : fruit ratio.

Strawberry variety performance in Ohio, W. P. Judkins (*Ohio Sta. Bimo. Bul. 231 (1944), pp. 266–267*).—Based largely on the results of trials at Wooster, a large number of varieties are rated as to their merit with notations as to time of maturity, yielding capacity, size of fruits, firmness of fruit, and quality. The four most important commercial varieties were Shelton, Premier, Catskill, and Green Mountain, the last an everbearer.

The effect of various treatments and methods of handling upon rooting of muscadine grape cuttings, F. F. Cowart and E. F. Savage. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 312–314*).—Treatment of muscadine grape cuttings with various growth-promoting substances, either in powdered or solution form, did not result in any material increase in the percentage of successful rooting. Root formation was apparently stimulated to a slight extent in some instances, but the increase in the actual number of cuttings to form roots was small. As to type of cutting wood, no difference was evident in the number of cuttings to form roots irrespective of the position of the parental shoot. Modifications in the rooting medium had no significant effect on the percentage of rooting. Storage of cuttings prior to setting directly in the rooting medium had no beneficial effect on percentage of successful rooting.

Fertilizing desert grapefruit, A. H. Finch. (Univ. Ariz.). (*Calif. Citrog., 30 (1944), No. 2, pp. 34–35, illus. 1*).—The leaf nitrogen in full-grown grapefruit leaves ranges from a minimum of about 1.2 to a maximum of about 2.2 percent of the dry weight of the leaf. A high level of leaf nitrogen in the winter and spring, declining to a low level in summer and fall, is indicative of a condition of orchard fertility favorable to high yields of good quality fruits. The use of leaf analysis in connection with a chart showing desirable seasonal levels of leaf nitrogen is offered as a key to the proper fertilization of Arizona grapefruit orchards.

Response of Deglet Noor date palms to irrigation on a deep sandy soil, W. Reuther. (U. S. D. A.). (*Date Growers' Inst. Rpt., 21 (1944), pp. 16–19, illus. 2*).—Young Deglet Noor date palms growing in sandy soil with no underlying silty soil until a depth of 9–16 ft. was reached made only about one-half the development of nearby palms located where silty soil was only a short distance from the surface. When the palms in the deep sand were supplied with a steady supply of water in addition to the regular irrigation there was a marked increase in vigor and number of inflorescences produced irrespective of whether nutrient materials were added with the water. The data suggested that insufficient water rather than inadequate soil fertility is the primary factor for the low vigor of date palms in deep sandy soils. The additional water should be particularly valuable to young nonbearing palms whose roots have not reached the deep lying silt layer. Apparently the rate of moisture loss by the palms is often so great that sandy soil cannot transmit water to the roots rapidly enough to supply the requirements for maximum vigor.

Glazing and hydrating dates, G. L. Rygg. (U. S. D. A.). (*Date Growers' Inst. Rpt., 21 (1944), pp. 7–10*).—Deglet Noor dates of No. 1 dry and waxy-tip grades gained in weight to the extent of 7–9 percent when held for 2 days in an atmosphere maintained at 117° F. and 90 percent relative humidity. The treatment softened the fruit enough to make it acceptable commercially, but did not impart stickiness to the surface. The dull finish resulting from the treatment can be remedied by exposing the dates to a temperature of 266°–284° for 5 min. while the air is stirred vigorously. This treatment melts the natural wax and imparts a luster to the skin.

The effect of certain wax emulsions on the incidence of shrivel and on the respiration and development of date fruits, W. Reuther and C. L. Crawford. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 172–182, illus. 3*).—Observations on dates taken from bunches, half of each of which was sprayed in different schedules with various wax emulsions while yet attached to the palms, showed that in general those emulsions in concentrations greater than 1 percent of solids reduced markedly the incidence of shrivel. The advantage was more than offset by the abnormally dark color of the ripened fruit, the undesirable flavor, and the loss in yield due to decay and drop. Certain wax emulsions having 1 percent or less of solids, when applied late, showed some promise for commercial control of shrivel.

The stronger wax emulsions did not markedly influence fruit respiration, but did reduce the dry weight of mature fruit without reducing fruit volume and also delayed ripening to some degree.

Specific gravity as a criterion of filling in the pecan nut, B. G. Sitton. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 89–93, illus. 2*).—The need is set forth for a simple and reasonably accurate measurement of the degree of filling of pecan nuts. Studies with selected Stuart and Schley nuts showed that the relationship between the specific gravity and the weight of the whole nut, the weight of the kernel, the weight of oil, the percentage of kernel, and the percentage of oil are all good indicators of the degree of filling. Specific gravity provides an integration of the weight, the size, and the shape, and is thus a measure that may be used to estimate filling in nuts of different sizes and of different varieties. Specific gravity proved to be correlated directly with the quality and flavor of the nuts. In Schley and Stuart, nuts having a specific gravity of 0.85 or higher were of high quality and excellent flavor.

Vegetable growth on Persian walnut trees associated with nut production, C. E. Schuster. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 85–88*).—Studies in two Persian walnut orchards, one located on a relatively poor hill soil and the other on a river-bottom soil, showed a much higher percentage of short shoots (12.9 cm. or less) in the trees on the poorer soil. Of the total crop of nuts borne on trees on poor and good soil, 72.9 and 50.0 percent, respectively, were produced on these short shoots. Observations on longevity of shoots showed the highest mortality among shoots 5 cm. or less in length and also among those that were not producing nuts. On Parisienne walnut trees for every 100 lb. of nuts matured during the season there were produced 21 lb. of new shoots, 25 lb. of hull, and 120 lb. of leaves. For every nut averaging 8.35 gm. there were 1.73 gm. of current shoot growth, 2.08 gm. of hulls and 10.09 gm. of leaves. From observations on a felled tree the author computed that on a basis of 100 lb. of nuts, there would be produced 214 lb. of wood, 25 lb. of hulls, and 120 lb. of leaves.

The initiation and development of foliar and floral organs in the tulip, J. E. Sass. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci., 18 (1944), No. 4, pp. 447–456, illus. 9*).—The observations made in a study of the seasonal sequence and histology of leaf and flower initiation in the tulip are reported.

A study of dormancy and germination of seeds of Cercis canadensis, M. Afanasiev. (Okla. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 10, pp. 405–420, illus. 4*).—Because of the impermeability of the seed coat to water and the protracted dormancy of the embryo, redbud seeds under natural conditions usually remain dormant for some years on the soil before germinating. Seed coats were rendered permeable by treatment with sulfuric acid, hot water, or mechanical scarification. Seeds held for 15 mo. required a lengthening of the sulfuric acid treatment. Afterripening of the embryo was hastened by stratifying acid-treated seeds. Holding afterripened seeds in pure oxygen for 24 or 48 hr. increased markedly the rate of germination. The optimum germination of afterripened seeds occurred at 70° F., with some germination at a temperature as low at 33°. At 100° germination was slow and the resulting seedlings were weak. Drying of afterripened seed tended to reduce germinability. Vitamin B_1 had no appreciable benefit on afterripening or germination. Catalase activity increased during the progress of afterripening.

FORESTRY

Our forests: What they are and what they mean to us, C. E. Randall and M. F. Heisley (*U. S. Dept. Agr., Misc. Pub. 162, rev. (1944), pp. 38, illus. 18*).—This revision, the original of which was noted earlier (E. S. R., 70, p. 190), contains information as to forests and how they grow, forest regions of the

United States, function of the forests in conserving water and soil, supplying lumber, fuel, and many products, fire control, insect and plant diseases, forest administration, and related topics.

The forest resources of Chile, P. A. Briegleb and I. T. Haig. (U. S. D. A. et al.). (*U. S. Dept. Agr., Agr. in Americas, 4* (*1944*), *No. 12, pp. 223–226, 234–235, illus. 5*).—Information is offered on the distribution and extent of Chilean forests, their approximate content of usable lumber, species, facilities for handling the forests, their output, etc.

The windbreak as a farm asset, C. G. Bates (*U. S. Dept. Agr., Farmers' Bul. 1405, rev.* (*1944*), *pp. 22+, illus. 9*).—This revision (E. S. R., 51, p. 146) contains an explanation of the general principles of protection obtained from planted windbreaks, the good and bad effects that may be expected, desirable species, management, etc.

Effects of fire on gum yields of longleaf and slash pines, V. L. Harper (*U. S. Dept. Agr. Cir. 710* (*1944*), *pp. 42, illus. 16*).—A study of the effects of different types of burning on the gum yield of longleaf and slash pines growing on the Olustee Experimental Forest, Fla., indicated that a light surface fire may be actually slightly beneficial, but that heavier fires are distinctly harmful. In the case of longleaf pine, a light surface fire increased yield of gum by about 4 percent the first year and had no appreciable effect on yield the second year. Similar effects could be expected with slash pine. With both species, heat treatments that killed needles decreased yields during the first succeeding year by as much as 19 percent, and mild crown fires reduced yields as much as 64 percent. Defoliation in late spring caused about twice as much reduction in yield as did defoliation in early spring. In the second year yields were approximately normal on all trees. Stem scorching caused no serious reduction in yield except in the case of unusually heavy crown fires. The advisability of deferring turpentining for 1 yr. after a mild crown fire and for 2 yr. after a heavy crown fire is suggested. Periodic burning with light surface fires is a precautionary measure against severe fires resulting from an accumulation of grass, vines, and underbrush.

Christmas tree test, R. B. Paton (*Ohio Sta. Bimo. Bul. 231* (*1944*), *pp. 257–259*).—Norway spruce brought into a room held at 68°–70° F. began to drop their needles in less than 14 days in nearly all cases, while comparable trees with their cut ends in water retained their needles an average of 21.9 days. Shellac treatment of the butts had no benefit on durability.

The chemical softening of wood for microtome sectioning, W. M. Harlow (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 63* (*1944*), *pp. 16, illus. 2*).—The author brings together descriptions of various methods as gleaned from the literature and adds the results of certain experiments conducted by himself.

DISEASES OF PLANTS

[Abstracts of papers accepted for presentation at the thirty-sixth annual meeting of the American Phytopathological Society, Cincinnati, Ohio, December 9 to 11, 1944] (*Phytopathology, 34* (*1944*), *No. 12, pp. 997–1014*).—Included are papers—in large part from State experiment stations—by various authors on plant diseases and their control. Those dealing with specific hosts are as follows: Apple—spray boom for ground spraying, Isothan Q15 against scab, Puratized N5D, Fermate, and Methasan against scab and bitter rot, and soil treatments v. replant survival in *Xylaria*-infested soils. Cabbage—benzene vapor against mildew, Ca-K balance in relation to club root, and breeding for yellows and mosaic resistance and high ascorbic acid content. Cereals and grasses—Traveler oats grain yield v. size of crown rust pustules; wheat stem rust in relation to temperature and nutrients, light v.

infection types by physiological races on resistant and susceptible varieties, and wheat improvement in relation to physiological races; *Xanthomonas vesicatoria* overwintering on wheat roots; root rots v. date, rate, and depth of planting spring wheat; *X. translucens* host relations, and seed and seedling infection of barley, wheat, and *Bromus inermis;* pyrenophora leaf spot of *B. inermis; Ustilago striaeformis* chlamydospore afterripening, and testing bluegrass for resistance; and ontogenetic characteristics of *U. linearis* f. *hordei.* Cherry—eradicant sprays for *Sclerotinia laxa,* fungicide and insecticide deposition on leaves, leaf spot control by high Ca v. high Mg-lime bordeaux, virus complex, and hosts of necrotic ring spot and yellows of sour cherries. Chrysanthemum—soil treatment for foliar nematode. Cotton—environal factors in boll shedding. Elm—bacterial wetwood, factors in Dutch elm disease development, and immunization against *Verticillium albo-atrum.* Flax—seedling blight and root rot in Washington State. Grape—black rot eradication by Elgetol, and phylogenetic relationships of nine known leafhopper vectors of Pierce's disease. Guar—lethal virus. Hops—twine treatment for downy mildew. Peas—anthracnose, treatment for *Aschochyta* on seed, and gene for resistance to near-wilt. Peach—X disease transmission to herbaceous hosts, and its chemotherapy. Potato—DDT tests, leafhopper and early blight control by zinc dimethyl dithiocarbamate, hormone treatment against sprouting losses, bacterial soft rot v. temperature, fusarium seed piece decay, disease resembling fusarium wilt, pythium tuber rot and wilt, pythiaceous stem-end rot, scab in relation to Ca-K balance, net necrosis and "stem-end browning" v. storage temperature, resistance to leaf roll, viruses of mottle and punctate necrosis identical, and nature and cause of purple-top wilt. Soybean—dusting for bacterial pustule control. Sugar beet—seedling diseases in Ohio. Tobacco—stimulation by peanut-hull meal in seedbed, relations of variety and inheritance to water-soaking, seedbed treatments, and blue mold eradication. Tomato—rhizopus stem blight, alternaria blight v. maturity, early blight and anthracnose control by zinc dimethyl dithiocarbamate, 10-State control test against anthracnose, defoliation disease control by 2,3-dichloro-1,4-naphthoquinone, predisposition to fusarium wilt, and fusarium wilt fruit invasion and seed carriage.

Other abstracts deal with bacterial invasion via stomata; tissue cultures as influenced by crown gall bacterial metabolites and tissue extracts and by culture media; preemergence damping-off severity in relation to growth rates of host and pathogen; basidiospore cultures of *Rhizoctonia solani* compared; electrophoretic studies of plant viruses, and a rapid method of mechanical transmission; and the influence of water on host plant predisposition to diseases.

Special studies on fungicides deal with the following: Assay by slide germination, by greenhouse weathering, and by greenhouse snapdragon rust technics; a new dust with adherence; pyridine, quinoline, and nicotinium derivatives as fungicides; compatibility of organic fungicides with summer oil; new organic fungicides for orchard fruits; the Zn salt of dimethyl dithiocarbamic acid (Methasan and Zincate) for vegetables; and the fungicidal action of reagents for amino acids, amines, aldehydes, and other reactive cell constituents.

The Plant Disease Reporter, [October 15 and 22 and November 1 and 7, 1944] (*U. S. Dept. Agr., Plant Disease Rptr., 28 (1944), Nos. 33, pp. 995–1026, illus. 2; 34, pp. 1027–1053; 35, pp. 1055–1081, illus. 2; 36, pp. 1083–1107*).—In addition to brief seasonal survey notes from the Emergency Plant Disease Prevention Project relating to such crops as cereals and grasses, corn, sorghums and related plants, field legumes, peanuts, potatoes, sweetpotatoes, celery and other vegetables, fruits, special crops, and miscellaneous plants, the above issues contain the following signed notes and articles:

No. 33.—Some cinchona diseases in the Western Hemisphere, by W. C. Davis and B. S. Crandall; further note on elm dying and phloem necrosis in Indiana, by J. S. Tidd; observations on *Phymatotrichum* root rot of guayule, by J. T. Presley; cotton diseases in New Mexico by W. G. Hoyman and in Oklahoma by H. W. Larsh; tobacco diseases in Maryland, by E. A. Walker; diseases on cowpeas in Arkansas and Oklahoma, by H. W. Larsh; diseases observed on various leguminous hosts in Mississippi and Louisiana, by D. C. Bain; diseases of snap beans and lima beans in North Carolina, by A. E. Prince; diseases of pinto beans in New Mexico during 1943 and 1944, by W. G. Hoyman; bean diseases in western Washington, by L. W. Boyle; potato diseases in Wisconsin, by E. E. Honey, R. E. Vaughan, and J. W. Brann; summary of the vegetable disease situation for 1944 in Massachusetts, by O. C. Boyd; and diseases and injuries of apple in Connecticut, by R. C. Cassell.

No. 34.—Fungi associated with decline of avocado and citrus in California, by J. V. Harvey; varietal susceptibility of currants to the cane blight organism and to currant mosaic virus, by E. M. Hildebrand and P. V. Weber; spray experiments with organic fungicides for the control of apple bitter rot, by J. C. Dunegan, J. W. Roberts, and M. C. Goldsworthy; corn root rot in Iowa in 1944, by E. F. Vestal; diseases of corn in Nebraska and Kansas, by C. M. Slagg; potato diseases in Wisconsin, by E. E. Honey and R. E. Vaughan; and asparagus rust in northeastern Illinois, by J. S. Tidd.

No. 35.—Observations on phloem necrosis of elm in Kentucky, Ohio, Indiana, and Illinois, by T. W. Bretz; can the adverse effects of virus diseases be corrected by extra fertilization and pruning the Montmorency cherry? by E. M. Hildebrand; pecan diseases in Oklahoma, by H. W. Larsh; diseases of storage crops in New England during the winter of 1943–44, and condition and diseases of potatoes in Aroostook County, Me., both by R. C. Cassell; diseases of pimento peppers in Georgia, by G. M. Stone; boron deficiency of rutabagas in southwest Virginia, by E. K. Vaughan and G. M. Shear; oats disease survey in northern Pennsylvania, by J. S. Niederhauser; corn diseases in north central Illinois, by J. S. Tidd and G. H. Boewe; rots of runner peanuts in southeastern Alabama, by G. M. Stone and C. Wilson; and diseases of peanuts in North Carolina, by A. E. Prince.

No. 36.—Potato storage in the Red River Valley of Minnesota, by I. W. Tervet; stem rot and other diseases of sweetpotatoes in the New Jersey-Delaware-Maryland area, by E. A. Walker; sweetpotato stem rot survey in South Carolina, by A. E. Prince; sweetpotato diseases in Indiana and Illinois, by J. S. Tidd; and rice diseases in Arkansas, by H. W. Larsh, and in Texas in 1944, by E. C. Tullis and G. E. Altstatt.

Cornell University abstracts of theses, 1943 (*Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 323–329, 333–338, 342–344, 347–356, 418–419*).—The following are of interest to plant pathology: A Study of Frost Injury and Resistance in Garden Roses, by G. N. Asai (pp. 323–326); *Fusarium* Wilt of Spinach, by O. S. Cannon (pp. 327–329); Powdery Mildew of Barley—Studies of Yield Losses and the Inheritance of Disease Resistance, by N. F. Jensen (pp. 333–334); Studies on Spray and Dust Schedules for Control of Apple Scab in Western New York, by F. H. Lewis (pp. 335–338); The Rust of Greenhouse-Grown Spearmint and Its Control, by J. S. Niederhauser (pp. 342–344); Some Studies on the Dutch Elm Disease and the Causal Organism, by S. A. Pope (pp. 347–348); Studies of Phytopathogenic Bacteria, by M. P. Starr (pp. 349–350); Effect of Temperature and Relative Humidity on Occurrence of Blossom Blight of Stone Fruits, by L. O. Weaver (pp. 351–353); Suscept Range of the Potato Yellow Dwarf Virus, by S. G. Younkin (pp. 354–356); and The Volatile Production of Apples and Its Possible Relation to the Apple Scald Disease, by F. W. Southwick (pp. 418–419).

[Abstracts of papers] (*Va. Acad. Sci. Proc., 1944, pp. 42, 48, 73*).—The following are included: Studies in the Physiology and Genetics of *Colletotrichum* *phomoides*, the Tomato Anthracnose Organism, by C. W. Roane and E. K. Vaughan, and Black Shank, a Little Known But Serious Threat to Tobacco Production in Virginia, by E. K. Vaughan (both Va. A. and M. Col.); and Technique for Measuring Resistance to Black Root Rot in Tobacco, by R. G. Henderson (Va. Expt. Sta.).

Plant diseases in Texas and their control, A. A. DUNLAP and J. F. ROSBOROUGH. (Coop. Tex. Expt. Sta. and U. S. D. A.). (*Tex. Agr. Col. Ext. [Bul.] 132 [1944], pp. 73, illus. 29*).—A revision of Texas Station Circular 91 (E. S. R., 85, p. 357).

Notes on Wisconsin parasitic fungi, III, H. C. GREENE (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 113–135*).—These miscellaneous notes (E. S. R., 89, p. 221; 91, p. 693), including additional plant hosts and additional species, are based chiefly on collections made during 1942.

Supplement to the revised list of plant diseases in Tanganyika Territory, G. B. and M. M. WALLACE (*East African Agr. Jour., 10 (1944), No. 1, pp. 47–49*).—This list includes also a small number of fungi recorded on noneconomic plants.[1]

Some aspects of plant pathology in Western Australia, W. P. CASS SMITH (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 3, pp. 93–101*).—An address discussing the history, contributions to agricultural progress, present activities and problems, future trends, and organization of plant pathology in this area.

Electrokinetic studies on Erwinia amylovora and Phytomonas stewartii in relation to virulence, V. L. FRAMPTON and E. M. HILDEBRAND. (*Cornell Univ.*). (*Jour. Bact., 48 (1944), No. 5, pp. 537–545, illus. 1*).—Pathogenicity or virulence in *E. amylovora* was not found correlated with electrophoretic velocity, and in neither species was the virulence of the pathogenic strains correlated therewith. Mobility-pH curves at constant ionic strength were determined for both organisms and appeared to be distinctive for each species. It was noted that age, storage, kind of media, and serum globulin (horse) did not affect the mobility of *E. amylovora.*

Notes on seed-borne fungi.—II, Alternaria, J. W. GROVES and A. J. SKOLKO (*Canad. Jour. Res., 22 (1944), No. 5, Sect. C, pp. 217–234, illus. 25*).—In this contribution (E. S. R., 92, p. 64), seven species of this fungus genus—of which six are definitely pathogenic—are reported to have been isolated from crop plant seeds. Cruciferous plants were attacked by three distinct species: *A. brassicae, A. oleracea*, and *A. raphani* n. sp.—here described; the last was isolated only from radish seeds. Two species were found on carrots: *A. radicina* and *A. dauci* n. comb.; a species close to *A. dauci* was isolated from flax and is described as *A. linicola* n. sp. The name *A. tenuis* is here used to include the generally saprophytic forms that have been isolated from seeds of a wide variety of plants; they exhibit many variations in culture characters, spore markings, etc., but all have spores falling within the range 20µ–50µ × 10µ–16µ. There are 31 references.

Inducing sporulation of Alternaria solani in culture, S. E. A. MCCALLAN and S. Y. CHAN (*Contrib. Boyce Thompson Inst., 13 (1944), No. 7, pp. 323–335, illus. 3*).—Undisturbed cultures of most isolates produced few spores or none, while potato dextrose agar cultures scraped and placed on a window sill sporulated more or less readily; other media tried or addition of various vitamin B components in conjunction with the above scraping and exposure were without effect or no better than the potato dextrose agar. Maximum vegetative growth and sporulation of scraped cultures occurred at 20° C.; at this temperature, sporulation tended to increase with decrease in relative humidity. Even with optima of both temperature and humidity, however, the spore yield of controls exposed on the window sill was not attained. Cultures exposed to irradiation from an open mercury arc lamp sporulated abundantly, under favorable conditions yielding about

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[1] East African Agr. Jour., 2 (1937), No. 4, pp. 305–310.

10 million spores per petri dish culture. Scraped cultures produced a maximum of spores following about 20 seconds' exposure; unscraped cultures required longer and produced less than one-sixth as many spores. Scraping before or after irradiation made no significant difference in yield. Maximum spore yields were obtained at 10-cm. distance from the lamp and with 2-week-old cultures. Following scraping and irradiation, there was a pronounced optimum at 20° for greatest sporulation. Irradiation through color glass filters markedly affected sporulation, which increased as the wavelength transmitted decreased. Greatest sporulation was obtained with filters whose limits of transmission were 249–254 mμ. Spores produced by irradiated cultures were equal in infective power to those from cultures exposed on the window sill. Maximum sporulation of this fungus (Maine strain 52) may be induced by growing on potato dextrose agar for 2 weeks at 20°, scraping, exposing to ultraviolet light for 20 sec. with lamps or filters transmitting to about 250 mμ, and returning to 20° for 2 days.

Ascochyta meliloti (Trel.) Davis as the conidial stage of Mycosphaerella lethalis Stone, F. R. JONES. (U. S. D. A. coop. Wis. Expt. Sta.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 137–138*).—An amended description is included.

Penicillin treatment of crown gall, J. G. BROWN and A. M. BOYLE. (Ariz. Expt. Sta.). (*Science, 100 (1944), No. 2606, p. 528*).—In further tests of penicillin against plant pathogenic bacteria (E. S. R., 92, p. 65), crown galls on bryophyllum induced by inoculation with *Agrobacterium* (*Phytomonas*) *tumefaciens* were destroyed by wrapping antiseptic cotton soaked in crude penicillin around them after puncturing the galls in numerous places with a sterile needle. The method is suggested for trial on nursery stock and set trees and other plants with galls limited to crown and other aerial parts.

A comparison of the toxicity of certain dyestuffs to the conidia of Fusarium culmorum, W. M. DION and K. A. LORD (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 221–231*).—As determined by the slide-germination technic, the toxicity of the basic dyes tested against spores of *F. culmorum* and *Cercosporella herpotrichoides* was unaffected by the acid radicle associated with the dye base. The high toxicity of malachite green to *F. culmorum* was reduced weight for weight and mole for mole by substituting ethyl, propyl, or butyl for the methyl groups. Reduction of this dye to malachite green leuco base removed its toxicity. Substitution of amino and alkylated groups in benzene nuclei of triphenyl methane increased the toxicity; acid groups reduced it. Sulfonation and carboxylation reduced toxicity to the vanishing point. Alkylation of amino groups increased the toxicity, but alkylation of benzene nuclei did not appreciably affect it. When the central C atom of the triphenyl methane dyes was replaced by N the diphenyl ammonium compounds were less toxic than the corresponding triphenyl methane compounds. Prevention of rotation of the animated benzene rings by bridging—in the *o*-position to central atom—with O or N, and so obtaining a planar molecule, only slightly affected the toxicity. Certain dyes stimulated fungus growth. The toxicity of the basic dyes seems thus to depend not on one specific part but on the molecule as a whole; within limits the structure may be varied without pronounced toxicity changes.

A new parasitic red alga from southern California, E. Y. DAWSON (*Bul. Torrey Bot. Club, 71 (1944), No. 6, pp. 655–657, illus. 4*).—*Loranthophycus californicus* n. gen. and sp. (Delesseriaceae)—parasitizing sterile fronds of an undescribed alga of the same family—is described.

Brazilian chytrids.——IV, Species of Rozella, J. S. KARLING (*Mycologia, 36 (1944), No. 6, pp. 638–647, illus. 28*).—Six species (one new) of this fungus genus parasitizing the mycelium or sporangia of *Pythium, Achlya, Cladochytrium, Endochytrium, Rhizophlyctis,* or *Rhizophydium* are considered. Five of these six hyperparasites have been recorded previously from the United States; their discovery in South America indicates this genus to be widely distributed geographically as well as in host range.

Untersuchungen über den Einfluss der Hitze auf den Rostparasitismus [Investigations of the influence of heat on rust parasitism], W. STRAIB and A. NOLL (*Zentbl. Bakt.* [*etc.*], *2. Abt., 106* (*1944*), *No. 13–15, pp. 257–277*).—Supplementing earlier studies of the influence of temperature on rust parasitism, the author investigated the action of supramaximum temperatures on the course of infection and behavior of the host plants against *Puccinia glumarum* and *P. triticina,* as well as their histological relationships. In this work heat was applied by immersion of the experimental plants in water heated to the desired temperature. Under like duration of treatment applied several days after inoculation, the external signs of resistance (chlorosis and necrosis) in suitable wheat varieties increased and then decreased in distinctness with rises in temperature up to about 35° C. For attainment of the same resistance picture at the higher temperatures—paralleling the results of warm-air treatment in earlier studies—an essentially shorter action time was needed than for the lower temperatures. To evoke resistance at 25°, immersion for 16 hr. sufficed; at 30°, 2 hr.; and at 50°, 1 sec. For complete suppression of fructification in the two fungi, 30° for about 15 hr., 40° for 10 min., and 50° for 5 sec. were necessary—in each case with treatment of the plants 5 days after inoculation; with earlier application of heat the duration of treatment was correspondingly shortened. Heat treatment of wheat leaves before inoculation led to increased susceptibility to both rust fungi; this was particularly noticeable in the highly resistant varieties of wheat. The most pronounced effects with both pathogens occurred at a water temperature of 50° applied for 40 sec. The effects were indicated macroscopically by break-down of the leaf spots and promotion of fructification in the parasites. The decreases in resistance thus induced were specific for both races and varieties of wheat, but the original degree of resistance of the host plant was later regained. Under the influence of high temperatures applied after infection had taken place, a gumlike substance was formed in the mycelium of both fungi, such as occurs in absolute host resistance. Values were ascertained for the minimum heat-application time needed for the formation of this substance, as well as for its rate of production. Heating the leaf blades before infection led to a temporary inhibition of the production of this gumlike substance and promotion of mycelial growth. An attendant phenomenon of resistance to these fungi was the more or less pronounced silicification of the tissues. The temperature-determined resistance depends on the greater heat susceptibility of the fungus itself; both species—as well in young as in old stages of infection—exhibited similar behavior to the applied heat, the hyphae becoming inhibited in growth and the haustoria frequently deformed and silicified. The different heat-determined types of infection were also recognizable microscopically by mycelial forms described in the text. Comparison of the microscopical behavior of *P. glumarum tritici* and the host cells in the so-called summer or field resistance of wheat varieties indicated a close correlation with the behavior of seedlings elicited by heat shock.

Untersuchungen über Wundreaktionen des Weizenblattes und ihre Beziehungen zur Rostinfektion [Studies of the wound reactions of wheat leaves and their relations to rust infection], A. NOLL (*Zentbl. Bakt.* [*etc.*], *2. Abt., 106* (*1944*), *No. 13–15, pp. 277–285*).—Formation of the gumlike substance in wounded wheat leaves was found strongly favored by high environal moisture. The optimum temperature for its production in wounds immersed in water was about 36° C., the process under these conditions being completed in about 10–12 hr. Formation of this material is said to be a resistance reaction of the wheat plant against attack by bacteria on the wound. After heat treatment of the leaves for about 20 sec. at 50° before wounding, this cell product was no longer produced and the wound became a focal point for tissue decay. After the action of frost, chloroform, and other factors described in the text the production of this material was prevented; the same was true in leaf infection by *Puccinia glumarum*. Etiolation of the plants led to no such inhibition. After a certain time following application of heat the tissues regained their original resistance and the ability to form this cell product; they were also protected against a repeated heat shock. The leaf cells around the wound became encrusted with large amounts of silicic acid. In etiolated leaves, the chloroplasts in the cells bordering the wound surface retained their normal form and color longer than in other parts; the nuclei of such cells were also more deeply stained with Delafield's haematoxylin than the other nuclei. Close resemblances were observed between these wound reactions and the resistance reactions of the host cells to rust infection—particularly as to the relations of temperature.

A new genus of smuts, M. J. THIRUMALACHAR (*Mycologia, 36 (1944), No. 6, pp. 591–597, illus. 11*).—This smut fungus, found on a tree—*Heptapleurum venulosum*—common in the mixed forests of Mysore, is described as *Mundkurella heptapleuri* n. gen. and sp. (Ustilaginales).

Two new records of Sphaceloma diseases in the United States, A. E. JENKINS. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 11, pp. 981–983, illus. 1*).—The author reports scab (*S. araliae*) on *Aralia spinosa* in a nursery in northeastern Missouri and gray scab (*S. murrayae*) on *Salix lasiandra* in Washington State.

The germination of the seed of Striga lutea.—I, Host influence and the progress of germination, R. BROWN and M. EDWARDS (*Ann. Bot. [London], n. ser., 8 (1944), No. 30–31, pp. 131–148, illus. 8*).—This parasitic flowering plant attacks the roots of various hosts of which corn, sorghum, and sugarcane are the most economically important. The majority of its seeds germinate only when exposed to stimulating material from the host roots; two methods are described for studying the quantitative aspects of the host-parasite relation in germination. The germination rate after exposure to the host stimulus was found to be enhanced by previous exposure of the seeds to moist warm conditions—believed to indicate that the host factor operates only at a comparatively late stage in germination. Although the majority of the seeds failed to produce a radicle unless exposed to the host factor, a small proportion under suitable treatment did so without it. In composite cultures of host roots and seeds of the parasite the frequency of germinated seeds tended to fall with increasing distance from the host root; this is believed to be the effect of a corresponding gradient in the concentration of the material from the host root. Comparison of the germination frequency along individual roots showed that those from different seedlings varied considerably in the rate of secretion of the host factor; observations of germination frequency at intervals in successive zones of a vertical series across which a host root grew indicated the secretion of the stimulant to occur only at the root tip. Germination along a host root was enhanced by production of laterals—attributed to the consequent development of additional root tips. It is suggested that since—with *S. lutea* seeds and possibly also with those of other similar parasites—germination can be arrested at a comparatively late stage by withholding the host factor without at the same time disturbing normal metabolic processes, such seeds may provide favorable material for studies of germination.

Direct and indirect actions of radiation on viruses and enzymes, D. LEA, K. M. SMITH, B. HOLMES, and R. MARKHAM (*Parasitology, 36 (1944), No. 1–2, pp. 110–118, illus. 4*).—When tobacco mosaic virus at various concentrations was inactivated by γ-rays, the inactivation dose was independent of concentration at the higher concentrations, and at low concentrations it also attained a constant but lower value. Over an intermediate range the inactivation dose increased with concentration of virus. These results are explained on the basis that when the virus is irradiated dry or in concentrated solution the inactivation is direct and due to ionization produced inside the virus particle; at lower concentrations the inactivation is largely indirect and due to ionization of the water. Gelatin added to the solution protected the virus against the indirect action of radiation. Curves are given of the inactivation of dry preparations of ribonuclease and adenylpyrophosphatase (myosin) by X-rays. On the assumption that a single ionization in an enzyme molecule leads to its inactivation, it is shown that measurement of the inactivation dose leads to a rough estimate of the molecular weight of the enzyme. There appears to be no fundamental difference between viruses and enzymes in their mechanism of radiation inactivation.

Descriptions and revisions of several species of viruses in the genera Marmor, Fractilinea, and Galla, H. H. McKinney. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 10, pp. 322–329*).—Several species and varieties of viruses infecting cereal and forage grasses are here described and named, and the descriptions of the wheat mosaic-rosette and tobacco ring-spot viruses are emended—the latter being transferred to the genus *Marmor* Holmes emend. The virus of mild dark-green mosaic in tobacco is described and named. The viruses of cereal grasses in Russia and Siberia are placed in the genus *Fractilinea*. The wheat mosaic viruses reported from Japan are believed very similar to the soil-inhabiting wheat mosaic viruses east of the Mississippi River, and no attempt is at present made to separate them. The virus of wallaby ear of corn is placed in the genus *Galla*. There are 37 references.

Some viruses transmitted by agallian leafhoppers, L. M. Black (*Amer. Phil. Soc. Proc., 88 (1944), No. 2, pp. 132–144, illus. 7*).—As a result of this study, a new genus, *Aureogenus*, is proposed to include potato yellow dwarf virus and two new potato viruses here described. It is further proposed that the New York potato yellow dwarf virus be named *A. vastans* var. *vulgare* n. comb; the New Jersey yellow dwarf virus, *A. vastans* var. *agalliae* n. comb.; and the new viruses, *A. magnivena* and *A. clavifolium* n. spp., respectively. The transmission tests were done on crimson clover. The New York virus was transmitted by *Aceratagallia sanguinolenta* (Prov.), *A. lyrata* (Baker), *A. obscura* Oman, and *A. curvata* Oman, but not by *Agallia constricta* Van Duz.; it was transmitted by only 2 of 465 *A. quadripunctata* (Prov.) and possibly by 1 of 220 *Agalliopsis novella* (Say). The New Jersey virus was transmitted by *Agallia constricta* and *A. quadripunctata* but not by *Aceratagallia sanguinolenta;* it is also possible that 1 of 241 *Agalliopsis novella* transmitted this virus. *Aureogenus magnivena* was transmitted by *Agallia constricta, A. quadripunctata,* and *Agalliopsis novella* but not by *Aceratagallia sanguinolenta. Aureogenus clavifolium* was transmitted by *Agalliopsis novella* but not by *Aceratagallia sanguinolenta, Agallia constricta,* or *A. quadripunctata.* There was evidence that the cases of rare transmission were real and not due to contamination.

Rootrots of cereals and grasses in North Dakota, R. Sprague. (Coop. U. S. D. A.). (*North Dakota Sta. Bul. 332 (1944), pp. 35, illus. 8*).—The increased importance of grass crops in the northern Great Plains stressed the need for this restudy of the causes of poor stands and low yields in grains and grasses due to soil fungi. The symptoms of root rot in North Dakota cereals and grasses were found separable into four types of injury: (1) Preemergence seed and seedling rots due to *Pythium debaryanum, Helminthosporium sativum, Fusarium* spp., and various molds, particularly in early spring, with *P. arrhenomanes* causing seed rot in later seedings; (2) damping-off due to *P. debaryanum* and related species soon after seedling emergence; (3) root browning or seedling blight due to *P. arrhenomanes* and causing cool-season grasses to wither and die about 6 weeks after April seeding and warm-season grasses, corn, and sorghum to be affected when seeded early before the soil is thoroughly warm; and (4) general root decay or necrosis due to *H. sativum, Fusarium* spp., *Curvularia geniculata,* and to some extent to *Pythium* spp. This injury is not confined to any period in the plant's growth, although most of the injury occurs in summer.

The most important fungus root parasites of grasses and wheat in the State are *P. arrhenomanes* and *H. sativum,* respectively; they attack almost all cereals and grasses. There are a number of strains of the root necrosis and damping-off Pythiums varying in ability to attack certain grass and nongrass hosts. Oats are moderately susceptible and wheats resistant to most of them; small seeded grasses such as blue grama and such grains as proso are usually highly susceptible when seeded in cool moist soil. Most Fusariums found in North Dakota are important only as early-season seed rots, but the much more parasitic scab-producing species are present in the Fargo area. *Rhizoctonia solani* is common on cereal and grass roots during wet weather, but most strains are not highly parasitic to most grasses and cereals in the State; it sometimes causes eye-spot at the stem bases of wheat. Pink root in maturing cereals and grasses is mainly due to a nonparasitic development of *F. oxysporium* or to a nonparasitic or semiparasitic attack by *Phoma terrestris.* The latter sometimes rots seeds of sorghums and corn during wet retarded early-season weather. Several common molds (e. g., *Alternaria* spp.) are nonparasitic on living cereals and grasses, but *C. geniculata* sometimes has strains causing root decay in some cereals and grasses.

Physiologic specialization of Puccinia glumarum Erikss. and Henn. in China, C. T. Fang (*Phytopathology, 34 (1944), No. 12, pp. 1020–1024*).—Nine physiologic races (C1–C9) of *P. glumarum* in 43 collections—most of them from Yunnan Province, China—were separated on differences in infection type on 7 varieties of wheat and 1 variety of barley. Of 1,487 varieties tested for reaction to these races, 30 proved either immune or highly resistant; since only 2 of the 30 were of Chinese origin, introduction of breeding material into that country may be advisable.

Pathogenicity on Avena and growth response of Pseudomonas coronafaciens (Elliott) Stapp, C. H. Kingsolver (*Iowa State Col. Jour. Sci., 19 (1944), No. 1, pp. 29–31*).—Abstract of thesis.

Soil conditions and the take-all disease of wheat.—VIII, Further experiments on the survival of Ophiobolus graminis in infected wheat stubble, S. D. Garrett (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 186–191*).—In this installment (E. S. R., 87, p. 382), assimilable nitrogen in various forms is shown to prolong the life of *O. graminis* in infected wheat straw, whether added directly to it or to the surrounding soil. When the infected straws were buried in washed quartz sand, 0.5 gm. N per 100 gm. air-dry straw proved the optimum dressing for longevity of the fungus; adding sodium phosphate did not significantly increase it. N is considered to prolong the life of *Ophiobolus* by enabling the mycelium to form new branch hyphae, which can explore unexhausted parts of the substrate; it is suggested that aged mycelium dies from carbohydrate starvation, through exhaustion of the zones of enzymic erosion around the hyphae. This hypothesis is supported by the extended life of the fungus in infected straws shaken twice weekly in 3 percent dextrose solution. *Ophiobolus* was found to survive longer in infected straws buried in a fallow soil than in the same soil under oats, mustard, or trefoil; this suggests the use of catch crops as competitors with the fungus for soil N.

Studies on seed treatments for cereal crops, W. E. Brentzel (*North Dakota Sta. Bul. 331 (1944), pp. 19, illus. 2*).—Ten proposed requirements of a satisfactory disinfectant are listed, and the results of seed treatment tests are presented. The plant emergence and seedling vigor from low test weight wheat were increased and oats smuts were satisfactorily controlled by seed treatment with an organic mercurial. The emergence from barley with low germination was considerably improved by either of two organic mercurials, and covered smut and stripe were controlled, emergence from blighted (*Helminthosporium* spp.) seed was increased, and smut of proso was prevented by ethyl mercury phosphate seed treatment. The stand of emmer was improved and smut reduced by organic mercurials. No apparent injury occurred in hard spring wheat stored 172 days after treatment with ethyl mercury phosphate or in durum wheat stored 285 days after treatment with the latter or with copper carbonate or basic copper sulfate. Four oats varieties treated with ethyl mercury phosphate were stored 48 days, also without injury. The emergence of hard spring wheat in soil generally was 7–14 percent lower than the official blotter germination and that of amber durum 1–8 percent lower; the figures for seed treated with ethyl mercury phosphate were 2.3 below and 2.4 percent above, respectively. It thus appears that only when treated with a suitable organic mercurial will wheat give an emergence approximately equal to the official germination. The emergence of flax in soil was 10–32 percent below that in the official blotter test. The average decrease from seven lots of seed was 18 percent; treatment with ethyl mercury phosphate reduced this difference to 10 percent.

Seed treatments, W. E. BRENTZEL (*North Dakota Sta. Cir. 69* (*1944*), *pp. 16, illus. 10*).—A revision of Circular 56 (E. S. R., 73, p. 194).

The short wet method of seed disinfection, A. E. MUSKETT (*Ann. Appl. Biol., 31* (*1944*), *No. 3, pp. 218–221, illus. 5*).—As good results against helminthosporium disease of oats were obtained by this as by the dusting method, Ceresan being employed. Suitable apparatus is necessary for the method, and two of the machines manufactured for the purpose are described.

Parasitism of Rhizoctonia solani on beans, L. H. PERSON. (La. Expt. Sta.). (*Phytopathology, 34* (*1944*), *No. 12, pp. 1056–1068, illus. 4*).—*R. solani* can induce damping-off and stem rot in beans under a rather wide range of temperature and soil moisture. The 27 isolates studied comprised a number of strains differing in culture characters and growth rate at different temperatures. Four rather clear-cut groups of isolates were distinguished on the basis of pathogenicity to beans: (1) Isolates from sugarcane and from sclerotia on potato tubers were nonpathogenic to beans; (2) those from peas caused a very slight amount of damping-off and a moderate stem infection; (3) the isolate from rice almost completely prevented emergence but caused less severe stem lesions than the pea isolates; and (4) isolates from bean, tomato, eggplant, and sugar beet proved capable of reducing stands somewhat and caused very severe stem lesions. The isolates in groups (2) and (4) could be further subdivided when cowpeas, English peas, soybeans, and broadbeans were added as differential hosts. The nonpathogenicity of the sugarcane and potato isolates is of interest and may be of possible importance when considering a rotation system for the alluvial sections of Louisiana. The above hosts are important economic crops in some of these areas.

Thermal inactivation of southern bean mosaic virus, W. C. PRICE (*Amer. Jour. Bot., 31* (*1944*), *No. 8, pp. 4s–5s*).—An abstract.

The reaction of varieties of Trifolium subterraneum to attack by Uromyces trifolii as a heritable character, K. L. HILLS (*Jour. Council Sci. and Indus. Res.* [*Austral.*], *17* (*1944*), *No. 2, pp. 74–78*).—The variety (Mt. Barker) of subterranean clover commonly grown in Australia is very susceptible to leaf rust; other varieties—particularly the early maturing types—are not attacked. By crossing Mt. Barker with the early Mulwala, it was shown that resistance to this disease is an inherited character, although early maturity tends to be associated with resistance. Both early and late segregates, however, have been obtained in the third generation of the cross which are immune and possess to a large extent the agronomic characters of the parents.

Factors influencing the development of cotton diseases, L. Ling (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 194–204, illus. 6*).—Under local conditions in Szechuan Province, West China, the incidence of most cotton diseases was observed to be influenced chiefly by air humidity. For sore shin, however, soil moisture and soil temperature have a more profound influence. In the case of cyrtosis—caused by leafhopper injury—the disease appears earlier with higher temperatures during the period of rapid reproduction of the insect, whereas heavy rainfalls reduce the intensity. Environal modification by varying the time of sowing influences the incidence of diseases affecting both seedlings and mature stages. Among seedlings the prevalence of anthracnose is influenced chiefly by air humidity; sore shin, on the other hand, requires a moist soil for spread and development. In the mature plant, late sowings increase the intensity of cyrtosis but reduce bacterial blight and anthracnose. As to culture practices, nitrogenous fertilizers generally increased the incidence of most diseases; denser stands and closer spacing brought a heavier infection in stem and leaf diseases but not in boll diseases; and a mixed cropping system apparently had no effect on the fungus and bacterial diseases but reduced the intensity of cyrtosis when the crop interplanted was not susceptible to leafhopper infestation.

Phoma stem disease of flax, C. R. Millikan (*Jour. Austral. Inst. Agr. Sci., 10 (1944), No. 3, pp. 129–130, illus. 1*).—A note on stem spotting in Victoria by *Phoma* sp., with symptoms apparently not those usually reported for flax infection with *Phoma* spp.

Physiologic specialization and the control of millet smut, C. S. Wang. (Minn. Expt. Sta.). (*Phytopathology, 34 (1944), No. 12, pp. 1050–1055*).—Of 9 collections of *Ustilago crameri* from China tested for pathogenicity on 12 millet varieties, 6 differed sufficiently in virulence on 5 differential hosts to be considered physiologic races. Although there were great differences in varietal reaction to smut races, no variety was resistant to all. Of 11 fungicides tested as seed disinfectants, all except powdered sulfur and formaldehyde dust reduced the smut infection. New Improved Ceresan was very effective, and formaldehyde dip, Cuprocide, copper carbonate, and Barbak III were fairly so; sulfur fungicides in general were not satisfactory.

Macrophomina root and stem rot and anthracnose of Chamaecrista, J. L. Weimer. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology, 34 (1944), No. 12, pp. 1077–1085, illus. 3*).—Two diseases of *Chamaecrista* (partridge-pea) are described, a root and stem rot and an anthracnose caused by *Macrophomina phaseoli* and *Glomerella cingulata,* respectively. So far as known, the former fungus attacks *C. procumbens* only; the latter is destructive both to this species and to *C. fasciculata.* Under the test conditions, *Macrophomina* was more pathogenic on young plants, but observations indicate that older plants can be killed by it. Anthracnose can kill seedlings in a few days, but only the actively growing ends of the branches of older plants are susceptible and mature plants are highly resistant.

Outline of procedure for the diagnosis of bacterial ring rot of potatoes—report of the committee of the Potato Association of America, D. P. Glick et al. (*Amer. Potato Jour., 21 (1944), No. 11, pp. 311–314*).—The report includes a recommended procedure applicable to routine inspection in field, car, or storage, involving field inspection for vine and tuber symptoms, car or storage inspection for tuber symptoms—including the ultraviolet light test, and elimination of infected tubers; and a procedure to be followed in other than routine inspection (e. g., when routine tests prove unsatisfactory or when recourse to law may be taken in case of the sale of supposedly infected seed tubers), involving the gram stain, isolation and identification of the bacterial agent, transmission of infection to a suitable host, and the ooze test.

Efficacy of the rotary knife in the control of potato ring rot, L. C. KNORR. (Cornell Univ.). (*Amer. Potato Jour., 21 (1944), No. 9, pp. 250–261*).—In two factorial tests of the rotary cutting knife, two $HgCl_2$ cut seed dips, and ultraviolet light against ring spot spread, the first method—with boiling water disinfection of knife—produced higher yields of both healthy and total tubers than the others and also led to a statistically significant reduction in the amount of ring rot-diseased tubers. In both tests $HgCl_2$ seed piece dips gave the greatest control of ring rot spread, but at the same time led to the smallest crop of healthy and of total tubers. Either the extent of the field lay-out or the differences obtained (or both) were too small to show results of statistical significance in controlling ring rot by ultraviolet light. Analyses of covariance showed a high correlation between stand and yield, indicating that the yield of total tubers (healthy + diseased) depended on the effect of the particular treatment on emergence. The picker planter in the field led to an apparent spread of ring rot, but since the difference was not statistically significant, the increase under the test conditions may have been due to variations.

The effect of sulphur and acid fertilizer on incidence of potato scab, J. H. MUNCIE, H. C. MOORE, J. TYSON, and E. J. WHEELER. (Mich. Expt. Sta.). (*Amer. Potato Jour., 21 (1944), No. 11, pp. 293–304*).—Applications of acid fertilizer alone and plus S in bands, plowed under, or disked into the soil reduced infection with *Actinomyces scabies*. The greatest reduction in scab resulted from applying 3,200 lb. S per acre plus acid fertilizer, but the yield was seriously impaired; the least scab occurred in plots with soil reactions of about pH 3.5–3.8. The potato scab organism was only partially inhibited in soils of low pH, and it gradually adapted itself to these conditions. The disease became more severe following addition of lime to bring the soil reaction to about pH 5.6. As compared with the crop of 1939, there was a noticeable decrease in percentage of clean tubers in the two crops following the second application of S in 1940, and this in spite of the fact that the soil pH in most (except the limed) plots remained lower.

Potato scab and seed piece decay control by seed treatment, J. A. BEARE (*Jour. Dept. Agr. So. Austral., 48 (1944), No. 1, pp. 12–13, illus. 1*).—The author reports effective control of scab and seed-piece decay by a new proprietary organic mercurial compound and by zinc oxide. The commercially significant scab in plots grown from untreated seed was about 10 percent, representing a loss of 1 ton per acre.

Transmission of potato virus diseases.—IV, Ground work studies on the growth of normal potato foliage, J. G. BALD (*Jour. Council Sci. and Indus. Res. [Austral.], 17 (1944), No. 2, pp. 94–111, illus. 3*).—A continuation (E. S. R., 90, p. 777). When periodic measurements of leaf area were made on plants of different varieties and strains during the earlier developmental stages, the growth rate of the total area was similar until about the inception of flowering; thereafter, the rates for early strains and varieties were less than for the later ones. The early agreement in leaf growth rate indicated that the metabolic processes underlying growth at that stage were equally efficient for all strains and varieties tested. The number of leaves developing on the main axes were similar. The differences in leaf area among the strains and varieties seemed to arise from differences in the time of inception of several development stages. In the Up-to-Date variety, which has very large leaves on the main axis, the development of axillary shoots occurred later than in varieties with smaller leaves; continued expansion of the leaves on the main axis apparently delayed the formation of axillary shoots. The difference in the times at which axillary growth began was not evident between early and late strains of the same variety. The main determinant of maturity was the growth of axillary shoots. Independently of varietal differences in time of inception of axillary growth, early maturing varieties and strains had a relatively slow axillary growth rate and late maturing ones had a relatively rapid axillary growth rate. It is suggested that differences in maturity are due mainly to competition for growth-promoting substances between above-ground axillary shoots and those below ground on which the tubers form.

Potato wart in America, R. E. HARTMAN and R. V. AKELEY. (U. S. D. A. et al.). (*Amer. Potato Jour., 21 (1944), No. 10, pp. 283–288*).—Potato wart (*Synchytrium endobioticum*) was found still confined to restricted areas in Pennsylvania. Its spread has been controlled by temperature and moisture relationships, immune varieties, and strict quarantine regulations as well as by those governing potato growing in the infested areas. Recently the problem has become more critical, because at least three new biotypes of the organism have been isolated in Europe and a number of varieties formerly believed immune are susceptible to these races; thus far no new races have been found in the United States. Tests of 14 new American varieties and the Dutch variety President indicate that Kathahdin, Mohawk, Sequoia, Mesaba, and Norkota may be considered immune and Houma very resistant. Of 117 seedlings from 14 crosses and 2 selfed lines tested, segregation for resistance occurred in 10; of these, 7 had Kathahdin as a parent. Two selfed lines of Katahdin showed about 50 percent of their seedlings to be very resistant. Of 60 other seedling varieties and commercial sorts tested, 11 proved immune, 4 very resistant, and 45 susceptible.

An Alternaria disease of safflower, S. CHOWDHURY (*Jour. Indian Bot. Soc., 23 (1944), No. 2, pp. 59–65, illus. 2*).—On a leaf spot of *Carthamus tinctorius* observed at Pusa and vicinity and found due to *A. carthami* n. sp., which is described.

Standard and new fungicides for the control of covered kernel smut of sorghum and their effect on stand, E. D. HANSING and L. E. MELCHERS. (Kans. Expt. Sta.). (*Phytopathology, 34 (1944), No. 12, pp. 1034–1036*).—Spergon, Arasan, New Improved Ceresan, DuBay 1452–C, and Corona Coppercarb proved efficient for increasing the sorghum stand and controlling *Sphacelotheca sorghi*. Neither micronized free-flowing sulfur nor micronized wettable sulfur appeared to affect the stand, but both gave satisfactory control of the smut.

The host-parasite relationship in susceptible cantaloups, resistant cantaloups, and cucumbers inoculated with Fusarium bulbigenum (Cke. and Mass.) var. niveum Wr. f. 2, C. E. COX (*Md. Univ. Off. Pub., 41 (1944), No. 6, pp. 14–15*).—An abstract.

A new virus disease of carrots, L. L. STUBBS and B. J. GRIEVE (*Jour. Dept. Agr. Victoria, 42 (1944), No. 9, pp. 411–412, 415, illus. 6*).—According to this preliminary report, a new virus disease of carrots has been responsible over a number of years for partial and in some cases complete failure of this crop in Victoria, Australia; though differing in important points, it somewhat resembles both aster yellows and western celery mosaic in symptoms produced. It was transmitted readily by a common and widespread aphid provisionally identified as *Cavariella aegopodii*. Certain carrot varieties were found tolerant to the disease, and further investigation of this phase of the problem is in progress.

The reaction of green pea varieties to downy mildew and two viruses, N. H. WHITE and T. D. RAPHAEL (*Tasmanian Jour. Agr., 15 (1944), No. 3, pp. 92–93, 97, 104, illus. 1*).—A test of 33 varieties of garden peas against *Peronospora pisi*, Pisum virus 2, and a virus resembling enation virus.

A leaf curl disease of tomato and its relation to some other plants, J. W. L. PEIRIS (*Trop. Agr. [Ceylon], 100 (1944), No. 1, pp. 14–19, illus. 7*).—The disease reported on was characterized by the upward curling, bronzing, and glossiness of leaflets and associated with and experimentally produced by mites. Sulfur dusting or use of a sulfur spray controlled the abnormality. Another type of disease caused by a virus (unpublished data) is distinguished by the upward curling and interveinal yellowing of the leaflets.

Factors influencing infection of the tomato by Verticillium albo-atrum, II, F. M. ROBERTS (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 191–193*).—In further work (E. S. R., 91, p. 45), tomato plants receiving adequate supplies of mineral nutrient were shown to acquire great resistance to infection by this fungus when the leaf-shoot ratio was reduced; this effect is attributed to a reduction in carbohydrate content of the host. Wide variation in potash manuring failed to affect the susceptibility to this pathogen.

Mycosphaerella tulasnei in apple and pear orchards, J. R. KIENHOLZ. (U. S. D. A.). (*Mycologia, 36 (1944), No. 6, pp. 648–649*).—Though *M. tulasnei* has been connected with its imperfect stage *Cladosporium herbarum*, the occurrence of its perithecia on fallen apple and pear leaves appears not to have been reported previously. Notes and measurements based on fresh material are included.

A study of the apple rot fungus Phialophora malorum, L. P. MCCOLLOCH. (U. S. D. A.) (*Mycologia, 36 (1944), No. 6, pp. 576–590, illus. 4*).—The serious losses caused by the fungus warranted further studies (E. S. R., 88, p. 491) on its morphology, physiology, and taxonomy, the detailed results of which are here presented, including an amended description of this variable species. *P. malorum* is primarily a saprophyte living in the surface soil and on the bark and in cankerous woody tissues of apple trees. The fruits become infected on the trees, and under favorable conditions the fungus develops and causes serious and unpredictable losses during storage. The majority of lesions on Winesaps appear to develop around the lenticels, though it is difficult to determine in many cases whether the point of entrance was via the lenticel or through a crack. The fungus also enters through insect and other injuries.

Effect of spray injury on pre-harvest drop of McIntosh apples, F. H. LEWIS. (Cornell Univ.). (*Phytopathology, 34 (1944), No. 12, pp. 1015–1019*).—Under uniform conditions of culture the amount of visible leaf injury and preharvest drop on McIntosh apple trees varied significantly with the spray treatment. Covariance analysis also showed a high correlation between leaf injury and preharvest drop, and both were greatest on trees sprayed with lime-sulfur, lead arsenate, and lime in the cover sprays. Flotation sulfur, lead arsenate, and lime in these sprays caused less leaf injury in July-August and less preharvest fruit drop than lime-sulfur, lead arsenate, and lime. It is believed that the excessive dropping of uninjured fruits from these trees can be explained on the bases of the amount of visible leaf injury, the time of injury, and the effect of the sprays on leaf efficiency.

Strains of prune dwarf, R. S. WILLISON (*Phytopathology, 34 (1944), No. 12, pp. 1037–1049, illus. 3*).—Four strains of prune dwarf virus (Prunus virus 6 or *Nanus pruni*), differing in virulence, were found occurring naturally—two on plum varieties and two on sweet cherry. The relationship of these strains was demonstrated by a comparative study of the symptoms of each in transmission tests with a series of hosts including varieties of *Prunus domestica, P. avium, P. armeniaca, P. cerasifera* (Myrobalan), *P. cerasus, P. mahaleb, P. persica, and P. salicina.* All strains induced strap-shaped rugose thickened leaves and dwarf growth on Italian prune and Lombard plum, stunting and leaf patterns on peach varieties, and leaf markings of various kinds and intensities on cherries and *P. mahaleb.* Symptom expression was either wanting or limited to faint leaf markings and occasionally dwarfing on most of the plum varieties tested. A tendency to recover was noted in peach and cherry varieties after appearance of the initial shock symptoms.

Plagas y enfermedades del cocotero de mayor importancia en la costa del Edo. de Yucatan [Pests and diseases of the cacao tree of major importance in the coastal region of the State of Yucatan, Mexico], L. H. ROBLES G. (*Fitófilo, 3 (1944), No. 2, pp. 3–25, illus. 5*).

Psorosis and related virus disorders on citrus, H. S. FAWCETT (*Calif. Citrog., 30 (1944), No. 1, pp. 14–15*).—A note on this group of disorders and their prevention and treatment.

Principales enfermedades del naranjo en la región de Santa Engracia, Tams. [Principal diseases of the orange tree in the region of Santa Engracia, Tams., Mexico], L. T. CORONA (*Fitófilo, 3 (1944), No. 2, pp. 26–46, illus. 7*).

Granulation and juice quality in Valencias as affected by insecticides, E. T. BARTHOLOMEW and W. B. SINCLAIR. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 11, pp. 10–11, 17; also in Calif. Citrog., 30 (1944), No. 1, pp. 4–5*).—Supplementing studies previously reported (E. S. R., 85, p. 369), two orange groves became available in which studies could be made of the possible relation of oil spray to granulation in the fruits. The results in one of these groves (1939–44), which had never been sprayed with oil before this experiment began, indicated a definite response to the oil in that granulation was increased and the soluble constituents in the juice were decreased. The response in the second grove were not so clear-cut, but it is pointed out that the long-continued use of oil spray before the present work began may have made it difficult to overcome any hold-over effect of the oil spray; that oil sprays may have a hold-over or residual effect was indicated also in the first grove. As a rule, the larger the fruits the more likely they are to become granulated, but oil spray appeared to augment the amount and severity of granulation regardless of fruit size.

Wilting of shoots in scented geranium (Pelargonium odoratissimum), M. J. THIRUMALACHAR (*Nature [London], 154 (1944), No. 3912, pp. 515–516, illus. 2*).—Ascribed to attack by *Sphaeropsis* sp., possibly *S. pelargonii*.

Diseases of the gladiolus, I, II (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 204–210, illus. 1; pp. 211–218, illus. 8*).

I. *Control of hard rot, due to Septoria gladioli Passer., by fungicidal treatment of the corms,* L. E. Hawker.—Losses from hard rot were reduced by treating the dehusked corms before planting with Hg_2Cl_2, $HgCl_2$, the proprietary mercurials—Aretan, Uspulun, and Ceresan—and by one nonmercurial—Folosan, the first proving least effective. All treatments were less satisfactory on corms with definite lesions. The weight of clean corms produced per old corm planted was usually increased by all treatments—calomel and Ceresan being least effective in this respect. $HgCl_2$ (3 hr. steep in 0.1 percent) was not rendered more effective by adding HCl or by a preliminary dip in methylated spirits to facilitate wetting, while a proprietary wetting agent—Agral—was definitely harmful to the corms and usually less effective than the $HgCl_2$ alone. November had some advantages over March as the time for treatment. All the mercurials tended to delay flowering, this being most marked in the presence of a wetting agent. Stunted foliage and poor quality flowers resulted from use of Ceresan.

II. *Experiments on dry rot disease caused by Sclerotinia gladioli Drayt.,* L. E. Hawker, R. J. Bray, and T. W. Burrows.—As shown by inoculations, young corms are the more susceptible but become less so as they develop, infection occurs in unwounded corms, and inoculation at the top of an old corm is more effective than at the side or base. The percentage of new corms produced from infected corms varied from 0 to 100, according to soil conditions. The disease is favored by wet soil. Removal of leaf bases increased the susceptibiilty of corms planted in contaminated soil, but the presence of these husks was not effective in control; dehusking did not increase the number of diseased young corms in an infected stock planted in new soil. No striking varietal differences in resistance were found. When corms of a diseased stock were treated with Hg_2Cl_2, $HgCl_2$, or Aretan, good control was obtained, calomel giving the most consistent results. Red copper oxide, formalin, and Ceresan were harmful. Sterilization of contaminated soil with formalin, $HgCl_2$, Aretan, or Uspulun gave good but not complete control, the first being least effective.

"Oedema," or "wart," of cultivated violet identified as scab, A. E. JENKINS. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 11, pp. 352–357, illus. 1*).—The author reports the recent identification of oedema or wart of *Viola odorata* as the disease now known as scab and caused by *Sphaceloma violae*. A summary of its known distribution indicates that it has been found in the United States in all coastal areas from Massachusetts to Texas (except Delaware); outside this country its known geographic range includes New South Wales and the Union of South Africa. There are 16 references.

Chlorine gas injures trees, L. H. JONES and M. A. MCKENZIE. (Mass. Expt. Sta.). (*Arborist's News, 9 (1944), No. 12, pp. 89–90*).—A note on Cl gas injuries, with report on a case and on laboratory tests suggesting that chlorinated water can be dangerous to plants only as the gas is released from solution and passes through the stomata of the leaf, where it destroys the chlorophyll.

American and blight-resistant chestnuts, R. B. CLAPPER and R. K. BEATTIE. (U. S. D. A.). (*Flower Grower, 31 (1944), No. 10, pp. 488–489, 500, illus. 4*).—A brief presentation of the history of the chestnut blight in America, of breeding for resistance to it, and of the status of American and oriental Castaneas in the United States today.

Distance as a dosage factor in the spread of Dutch elm disease, G. A. ZENTMYER, P. P. WALLACE, and J. G. HORSFALL. (Conn. [New Haven] Expt. Sta.). (*Phytopathology, 34 (1944), No. 12, pp. 1025–1033, illus. 2*).—When plots were established around large spontaneously infected elms located at least a half mile from other sources of *Ceratostomella ulmi,* the probability that a tree would become infected was found to decrease directly with the logarithm of the distance from the source of infection; spread of the fungus thus follows the logarithmic dose-response relation found in many biological investigations. Since a rectilinear relation exists between the logarithm of the distance and the percentage of infection (as probits), distance from a source of inoculum has an effect inversely equivalent to that of dosage of spores. A regression line calculated from the data proved useful in determining probabilities of infection for trees at varying distances from the disease source and thus is of value in local control measures. Probabilities of infection at 500 ft. under the conditions of these plots were approximately 1 in 500. New infections were markedly restricted to the immediate vicinity of the original infected trees, 75 percent of the newly diseased trees being within 100 ft. and 40 percent within 75 ft. of the original source of infection. Statistically, the difference in amount of infection between the north and south halves of the combined plots was at the margin of significance. Prevailing south winds during beetle emergence probably caused this divergence.

Sapstreak, a new killing disease of sugar maple, G. H. HEPTING. (U. S. D. A.). (*Phytopathology, 34 (1944), No. 12, pp. 1069–1076, illus. 3*).—The new vascular disease reported as causing heavy local losses in sugar maple near Asheville, N. C., is characterized by thinning and ultimate death of foliage—usually within 2–4 yr. after onset of symptoms—accompanied by water-soak and radial gray and red streaks in the sapwood. The disease has been reproduced by inoculation with isolates morphologically indistinguishable from the common sap stain fungus on hardwood lumber earlier referred to *Endoconidiophora coerulescens* but recently recognized as distinct and renamed *E. virescens* (E. S. R., 91, p. 705).

Modification of procedure for differentiating the telia of Cronartium ribicola and C. occidentale, M. S. Cave (*Stain Technol., 19 (1944), No. 4, pp. 141–142*).—The ranges of these pine rusts now overlap in parts of the western United States, and on leaves of *Ribes* the telia are morphologically undistinguishable. Since one is under quarantine regulation and the object of a large-scale control program while the other is of little consequence, a reliable and rapid differential method was highly to be desired. The microchemical method of Acree and Goss (E. S. R., 78, p. 202) has proved successful, but when large numbers of tests are being made a shorter schedule would be advantageous; such a method—here described—is said to have given as satisfactory differentiation as the longer schedule.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The natural history and behavior of the western chipmunk and the mantled ground squirrel, K. Gordon (*Corvallis: Oreg. State Col., 1943, pp. 104, illus. 15*).—A monographic study, including the taxonomy, description, distribution, biology, ecology, behavior, and information lacking or little known on the western chipmunks (*Eutamias*) and the mantled ground squirrels (*Citellus*) in western North America.

An investigation of Myxomatosis cuniculi with special reference to the possible use of the disease to control rabbit populations in Australia, L. B. Bull and M. W. Mules (*Jour. Council Sci. and Indus. Res. [Austral.], 17 (1944), No. 2, pp. 79–93*).—The virus of myxomatosis is highly pathogenic and lethal to the European rabbit, but is said not to cause disease in other animals. The general results of this study—details of which are presented, and especially those of the field experiments and field trials—show that the disease cannot be used with any promise of success in controlling rabbit populations under most natural conditions in Australia. It seems possible, however, that in some parts of the country under special conditions—including the abundant presence of insect vectors and absence of predatory animals—it could be used with some promise of temporary control.

The pine mouse in your orchard, L. Davis. (Univ. Tenn.). (*Tenn. State Hort. Soc. Proc., 38 (1943), pp. 48–50*).—A note on *Pitymys pinetorum* and its control.

Red squill as a raticide, D. D. Green (*Soap and Sanit. Chem., 20 (1944), No. 11, pp. 101–102, 133*).—A general discussion, including some of the newer developments such as the fortification of red squill powders weak in potency.

Red squill, L. R. Parkinson. (Mass. Expt. Sta.). (*Pests, 12 (1944), No. 11, pp. 26–28*).—Essentially noted from another source (E. S. R., 92, p. 234).

[Bird notes] (*Auk, 61 (1944), No. 4, pp. 640–643, 644–645, 650–651*).—The following brief notes are included: An Arizona Nest of the Coppery-Tailed Trogon [*Trogon ambiguus ambiguus*], by A. A. Allen (pp. 640–642) (Cornell Univ.); Food of White-Rumped Shrikes [*Lanius ludovicianus excubitorides*], by G. F. Knowlton and F. C. Harmston (pp. 642–643) (Utah Expt. Sta.).; Observation on the Food of the Bronzed Grackle [*Quiscalus versicolor*], by S. G. Ernst (pp. 644–645); European Widgeon [*Mareca penelope*] in Alabama, by H. M. Stevenson (p. 650); and European Widgeon in California, by M. F. Reece (pp. 650–651).

[Bird notes], L. E. Hicks. (Ohio State Univ.). (*Wilson Bul., 56 (1944), No. 3, pp. 169, 174*).—These include: The American Egret [*Casmerodius alba egretta*] Breeding in Ohio and Blue Grosbeak [*Guiraca c. caerulea*] Breeding in West Virginia.

Notes on some Virginia birds, C. E. Addy. (Va. Expt. Sta. et al.). (*Auk, 61 (1944), No. 4, pp. 580–583*).

Estudio bionómico de los pájaros nidófilos.—I, Oscinas: "Passer domesticus" L. [Bionomic study of nidophile birds.—I, Oscines: P. domesticus], P. I. Sala de Castellarnau (*Brotéria, 13 (1944), No. 2–3, pp. 75–87*).—On the ecology of the English sparrow.

semicarbazide—a fairly toxic stomach poison but also injurious to foliage. The 50 compounds found relatively nontoxic are listed by name only.

The toxicity of sulfur dioxide, acetone, and ethylene oxide alone and in combination, E. M. Swisher. (Ohio State Univ.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 690–693, illus. 3*).—The author reports the results of a series of laboratory tests designed and conducted in an attempt to gain a clearer understanding of joint toxic action and the methods of determining it. Since the test mixtures used were found to be within the category of similar joint action and to exhibit no evidence of synergism, no actual data were available for synergistic tests. Nevertheless, a clearer understanding of joint toxic action and the difference between similar and synergistic action is gained from a study of these tests. The term synergistic is often used loosely and incorrectly as applying to a type of toxic action which is in the category of either independent or similar joint action. Combinations which might exhibit similar or independent rather than synergistic action are believed to offer many more practical possibilities than synergistic combinations, since it seems that true synergism is rare. The manufacturer or consumer may not be concerned as to the type of action given by a mixture so long as the product offers an improvement over the components alone. To the toxicologist attempting to evaluate a mixture accurately, however, the type of toxic action exhibited is a significant factor, and it is urged that the present policy of loosely labeling any and all promising combinations as synergistic be discontinued. The details and methods used in this study are fully considered.

Relation of chemical constitution of some N-heterocyclic compounds to toxicity as fumigants, H. L. King and D. E. H. Frear. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 629–633, illus. 1*).—This investigation included tests of 13 pyridine derivatives as fumigants against a common red spider, *Tetranychus telarius* (L.), 28 against the large milkweed bug, and tests of 34 materials related to pyridine against the confused flour beetle. Emphasis was placed on a study of the relationship between toxicity and length, position, and type of side chain. It was evident for all tests that in a series of 2–*n*–alkyl-pyridines a pronounced peak of toxicity occurred at the propyl– or butyl–derivative. Alkyl pyridines with side chains in the 4–position proved more toxic than the 2–substituted isomers, and compounds with normal side chains were usually more toxic than the branched isomers. The two alkyl piperidines available were more toxic than the corresponding pyridines. The relative toxicities of the materials tested against red spiders showed a high degree of correlation with the action of the same compounds against the two insect species studied.

Comparative toxicities of copper hydroarsenate and copper hydroarsenate-arsenite mixtures, J. W. Apple and C. H. Richardson. (Iowa Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 666–671*).—The greatest susceptibility to these two new basic arsenicals among the insects tested was shown by the differential grasshopper, followed by Colorado potato beetle larvae, the imported cabbageworm, and the corn earworm. Copper hydroarsenate proved the more toxic to potato beetles but was less so against cabbageworms and the spotted cucumber beetle; there was no significant difference in these materials against grasshoppers. These new products were more effective against cabbageworms than calcium arsenate. All three had similar toxic effects on the grasshoppers, but calcium arsenate was definitely more toxic to potato beetle larvae and corn earworms. Against the spotted cucumber beetle, calcium arsenate was about as toxic as the arsenate-arsenite but more so than copper hydroarsenate. Lead arsenate was less effective than the new products on grasshoppers and cucumber beetles, but was more effective against potato beetle larvae and corn earworms. Against cabbageworms, the hydroarsenate-arsenite and lead arsenate had similar toxicity, and both were more toxic than the hydroarsenate. Paris green was the most toxic compound against all insects tested, but two special arsenicals—the reacted paris green-calcium arsenate product and cupric metaarsenate—as tested against two insects were found nearly as toxic as paris green. Tests with potato beetle larvae and corn earworms revealed a definite repellent effect of the new arsenicals, with the hydroarsenate-arsenite apparently the more effective in this respect. Tests of toxicity to plants in the laboratory indicated the new compounds to be less injurious to bean foliage than the other arsenicals.

The picric acid method for determining minute amounts of hydrocyanic acid in fumigated insects, W. B. SINCLAIR and R. C. RAMSEY. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.], 16 (1944), No. 6, pp. 291–300, illus. 4*).—This contribution reports the development of a micromethod for determining amounts of HCN in the range of 0.005–0.200 mg. The HCN is distilled with a microdistillation apparatus from the fumigated insects into Na_2CO_3. Picric acid is then added to the alkaline distillate, diluted to a definite volume, and heated in a water bath for development of color. Color intensity is determined with a photoelectric colorimeter. Directions are given for controlling factors affecting color development.

Electrostatic charge effects produced by insecticidal dusts, H. F. WILSON, R. J. JANES, and E. J. CAMPAU. (Univ. Wis.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 651–655, illus. 1*).—Through use of a method devised for recording the electrostatic charges of blown dust, a preliminary study of samples of some commercial powdered insecticides and fungicides showed that there is a variation in the capacity of different mineral combinations to produce such charges. The sign of charge for all the materials studied was positive. Some differences in dispersion apparently influenced by the degree of charge were also noted, though until a more complete study is made it cannot be said that they were significant from the standpoint of insect or plant disease control. Finely ground plant and animal tissues of a granular nature produced electrostatic charges; those produced by plant materials were affected by the average particle size. When powdered dusts producing electrostatic charges were blown through tubes made of different metals no noticeable change in sign of the dusts could be observed; when such dusts were blown against plants an induced charge opposite to that of the dust was imparted to the plant and carried for its full length.

Intimate blending of dust insecticides, T. B. DORRIS (*Soap and Sanit. Chem., 20 (1944), No. 11, pp. 111–117, illus. 3*).—A discussion of the methods and potential importance of intimate blending, "which is capable of transforming ordinary insecticide mixtures into products of streak-free uniformity."

More efficient control of the use of insecticides is urgently needed, J. E. ECKERT. (Univ. Calif.). (*Iowa State Apiarist Rpt., 1943, pp. 62–67*).—A general discussion of the subject, with particular reference to beekeeping.

Wheat flour as an adhesive for sprays, L. T. GRAHAM, R. M. SANDSTEDT, and H. D. TATE. (Nebr. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 599–604*).—In tests of the tenacity of spray components applied as suspensions—using insoluble copper sulfate as spray component or indicator—wheat flour gave a significant increase in tenacity, but addition of lime proved superior to the flour alone. The optimum amount of lime was about 0.09–0.36 gm. to 3 l. of spray, smaller or larger quantities giving reduced values. Added acetic acid or NaOH improved tenacity little if at all. On a paraffin surface, soybean flour alone was better than wheat flour alone, but with added lime they were equally effective. On a cellulose-nitrate surface plus combination with lime, wheat flour was superior to soybean flour. Used with lime, the optimum quantity of wheat flour was about 8 oz. and of soybean flour 1 oz. or more to 100 gal. of spray. Hardness of water had little effect on tenacity when flour was used alone, but with lime the use of tap water in diluting the spray gave a markedly higher tenacity index than when distilled water was employed. Of the components of flour, gliadin was apparently the best adhesive. Spray tests on greenhouse-grown potato plants indicated that addition of flour alone increased the tenacity only slightly; flour plus lime did so markedly. The latter combination was significantly better than soybean flour alone or with lime; with added lime, the tenacity of soybean flour was increased only slightly if at all.

The use of oleic acid and aluminum sulfate to increase deposits of nicotine bentonite, C. C. ALEXANDER, C. C. CASSIL, F. P. DEAN, and E. J. NEWCOMER. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 610–617, illus. 1*).—Results of the tests reported indicate 1–5 dry-mix nicotine bentonite applied with mineral oil, oleic acid, and $Al_2(SO_4)_3$ to be as effective as lead arsenate against the codling moth in the Pacific Northwest. The amount of nicotine sulfate used in these sprays was half that used in tank-mix nicotine bentonite sprays. Washes for cleaning apples sprayed with lead arsenate removed the spray deposit satisfactorily at harvest. As used, 1–10 nicotine bentonite failed to control the codling moth. Until the amount of nicotine needed in sprays is reduced or the price of nicotine lowered, nicotine-bentonite sprays will not be as economical as lead arsenate against the codling moth in this area.

The protective value of asphalt laminated paper against certain insects, H. L. SWEETMAN and A. I. BOURNE. (Mass. State Col.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 605–609*).—A 2-ply asphalt laminated Kraft paper sealed with an asphalt-glue adhesive was found to offer considerable resistance to penetration by the brown-banded roach and by the American, Australian, and German cockroaches, by three species of thysanurans (silverfish, firebrat, and the four-lined silverfish *Ctenolepisma quadriseriata*), and some resistance to a subterranean termite, *Reticulitermes flavipes*. The termites and firebrat seemed most likely to penetrate the wrapping paper in the shortest time. The American cockroach and firebrat caused the most damage. A fungicide—Dowicide G—in the adhesive offered little protection against fungi in the environments; at 1-percent concentration it greatly reduced the attractiveness of the adhesive to roaches and thysanurans, but the firebrat and silverfish still fed extensively on the adhesive during a 7-day test. Termites tubed over but did not injure paper in contact with 0.3 and 1 percent of fungicide in the adhesive, but damaged paper in contact with weaker concentrations.

Insecticidal action of D. D. T., H. MARTIN and R. L. WAIN (*Nature [London], 154 (1944), No. 3912, pp. 512–513*).—A preliminary note on studies leading to a working hypothesis on the mode of action of DDT and its analogs which has enabled the prediction of insecticidal activity in related compounds.

Summary of toxicological studies of the insecticide DDT, 2,2-bis (p-chlorophenyl) 1,1,1-trichloroethane, J. H. DRAIZE, G. WOODARD, O. G. FITZHUGH, A. A. NELSON, R. B. SMITH, JR., and H. O. CALVERY (*Chem. and Engin. News, 22 (1944), No. 17, pp. 1503–1504*).

Drug aspects of DDT, A. J. COX (*Calif. Citrog., 30 (1944), No. 1, pp. 6, 22–23, 26–27*).—An address summarizing previous findings on the toxicology of DDT, with special reference to its direct effects on man and animals and the dangers from its use on plant products to be used as food.

The biology and control of the camel cricket Daihinia brevipes, F. E. WHITEHEAD and F. D. MINER. (Okla. A. and M. Col.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 573–581, illus. 5*).—*D. brevipes* Hald.—found in the Great Plains States from North Dakota to northern Texas—is reported from Oklahoma as injuring various crops, such as tomatoes, watermelons, cotton, and cowpeas, in the seedling stage and mostly in sandy areas. It feeds at night, spending the day in burrows. During 2 yr. of intensive study serious crop injury was not observed, but indications are that such may occur under some conditions. Winter is passed as a semiactive nymph in burrows; the adult stage is reached about May 1, and oviposition occurs throughout June. The eggs—laid in the soil surrounding the burrow—hatch in late September, and the nymphs dig their way to the surface. There is one generation a year. Nocturnal activity was not closely correlated with weather, and migration appeared rather limited. The burrows increased in depth from 3 in. in February to 1–5 ft. in June. The number of eggs averaged 26.8 in the soil around each burrow. The insect is general in feeding habits; besides growing plants, it was observed to feed on such material as dry sticks, weed seeds, rabbit pellets, and on other insects including its own species. Poison bran mash gave satisfactory experimental kills.

A new Sericothrips from Brazil (Thysanoptera: Thripidae), J. C. CRAWFORD. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 7, pp. 200–201*).—*S. sidae* n. sp.—host *Sida rhombifolia*—is described at this time because its name is needed in connection with a study of insect vectors of infectious chlorosis of malvaceous plants.

A review of the North American species of Linnaemya sens. lat. (Diptera: Tachinidae), A. R. BROOKS (*Canad. Ent., 76 (1944), No. 10, pp. 193–206, illus. 11*).—New taxonomy and keys to the adults and first-stage maggots of this group of parasitic flies are included.

New North American Tachinidae belonging to the genus Muscopteryx (Diptera), H. J. REINHARD. (Tex. Expt. Sta.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 3, pp. 352–358*).—A taxonomic study of seven species of this genus of tachinid flies, of which six are described as new.

On the food relations of Eurygaster integriceps in the highland of Western Uzbekistan, K. V. ARNOLDI (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 1, pp. 32–35*).—On the food plants of the adults and larvae of this species of shield-backed bug, with particular reference to forage crops of the grass family in this part of the U. S. S. R.

A new aphid on guayule and notes on other species of Cerosipha, E. O. ESSIG (*Hilgardia [California Sta.], 16 (1944), No. 4, pp. 177–184, illus. 6*).—A new species of aphid, *C. californica* Essig, collected on guayule, prune roots, and potatoes in California and on tomato in Waipaha, Oahu, Hawaii, is described. Keys are given to the known species of *Cerosipha,* and brief descriptions are included for *C. araliae-radicis* Strom, *C. forbesi* (Weed), *C. rubifolii* (Thomas), and *C. roripae* Palmer.

Notes on leafhoppers with descriptions (Homoptera: Cicadellidae), D. J. KNULL. (Ohio Sate Univ.). (*Ohio Jour. Sci., 44 (1944), No. 5, pp. 239–242, illus. 7*).—Includes new species of *Xestocephalus* and *Stirellus.*

A new genus (Tenucephalus) and species of Mexican leafhopper related to Parabolocratus, D. M. DELONG. (Ohio State Univ.). (*Ohio Jour. Sci., 44 (1944), No. 5, pp. 236–237, illus. 6*).

Descriptions of nine species of Aleuroplatus from eastern North America (Homoptera: Aleyrodidae), L. M. RUSSELL. (U .S. D. A.). (*Jour. Wash. Acad. Sci., 34 (1944), No. 10, pp. 333–341, illus. 13*).—The nine species of whiteflies here treated (seven new) are said to form a well-defined closely allied group which is apparently of actual or potential economic importance, since several species occur on plants of commercial value and one is a suspected vector of the blueberry stunt virus disease.

Bionomics and control of the nigra scale Saissetia nigra, R. H. SMITH (*Hilgardia [California Sta.], 16 (1944), No. 5, pp. 225–288, illus. 21*).—*S. nigra* Neitner is recorded from 161 species of plants in California and 148 species elsewhere in the world. Taxonomic descriptions are given of all stages. Establishment of this species in California was first reported in 1920, and in the period 1936–40 it was exceedingly prevalent on trees and shrubs in the coastal region. Only one generation occurs annually. The adult stage is reached in April, May, or June, and egg laying extends from about the middle of May until February. Little growth occurs during the summer, fall, and early winter months, but rapid growth begins in late winter. Reproduction is parthenogenetic. The average number of eggs per female is 628. Many predaceous enemies are mentioned. About 25 species of hymenopterous parasites are recorded from various parts of the world. A species of *Torulopsis* or *Rhodturla,* a symbiotic organism, is present in large numbers in all stages of the scale. In the period 1939–40 the scale became almost exterminated in southern California from causes ascribed to natural mortality. The author discusses the possibility that the near extermination of the scale may have been the result of a disease caused by a virus or a micro-organism. The parasite *Metaphycus helvolus* Comp. has been an important natural enemy since 1940. Light-medium oil spray, used at the rate of 1.5 to 2 gal. to 100 gal. of water and applied in late summer or early fall, has given satisfactory control.

A list of over 100 literature citations is appended.

A mariposa oriental das frutas Grapholita molesta (Busck), H. S. LEPAGE and M. FADIGAS, JR. (*Biológico, 10 (1944), No. 5, pp. 135–140, illus. 5*).—On the history, distribution, characteristics, biology, and control of the oriental fruit moth and the nature of the damage which it causes.

Susceptibility of Japanese beetle larvae to Bacillus popilliae, R. L. BEARD. (Conn. [New Haven] Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 702–708, illus. 2*).—The incidence of milky disease among third instar Japanese beetle larvae was found to be a probit response to the logarithm of spore concentration of *B. popilliae* injected parenterally. Similarly, when beetle grubs were reared in soil containing the organism the incidence of disease followed a probit response to the logarithm of the spore concentration. As judged by these two modes of infection the virulence of *B. popilliae* in causing milky disease of the larvae is far less than that of *B. larvae* in causing foulbrood of honeybee larvae. Spores of *B. popilliae* injected into the alimentary tract of beetle grubs failed to demonstrate a well-defined dosage effect, and the disease incidence was less than expected. Beetle grubs failing to take the disease after a parenteral injection of spores may be less susceptible to a second injection, indicating a kind of resistance; reduced potency of the spores may also act independently to cause less disease than expected. In one test, grubs failing to acquire milky disease after one exposure to contaminated soil failed to show any diminished susceptibility when given a second exposure. This apparent contradiction of other tests may have been due to the technic employed in detecting the disease.

The life history of Phyllophaga calceata and of P. micans, H. J. REINHARD. (Tex. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 581–587*).—The history of a complete generation of the May beetles *P. calceata* (LeConte) and *P. micans* (Knoch) in Texas was about as follows: Maximum numbers of overwintering adults emerged during April, and eggs were commonly present during the latter part and throughout May. About 25 days were required for the eggs to hatch. The larvae fed through the summer and after molting twice attained full growth by September or October. Normally the mature grubs passed the winter and remained quiescent during the following spring and summer until after mid-July, when pupation began; the average duration of the larval stage was 413 days. Pupation began during the latter half of July, and pupae were commonly present during August and September. About 23 days were required in this stage for transformation to adults; these remained within the pupal cells throughout the following winter and emerged the next spring to complete a 2-yr. life cycle.

Toxicity of cryolite to Mexican bean beetle larvae, G. WENE and R. HANSBERRY. (Cornell Univ.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 656–659, illus. 4*).—In laboratory cage tests against larvae of this pest, cryolite sprays were highly toxic, though slow acting and repellent. First to third instar larvae were more susceptible than fourth instar larvae. To obtain high kills with the last, 3–4 days of feeding on heavy deposits seemed necessary; 2 days sufficed for the younger stages. Time-mortality lines plotted according to the methods of probits were convex curves instead of straight lines, and are considered to be shaped by the nature of the feeding rather than by that of the toxic action of ingested cryolite.

Wireworms and food production: A wireworm survey of England and Wales, 1939–1942 (*[Gt. Brit.] Min. Agr. and Fisheries Bul. 128 (1944), pp. 62+, illus. 8*).—This report takes up the technic of wireworm sampling, wireworm populations, and the influence of wireworms on the establishment and success of arable crops; these matters are followed by a discussion of the findings from the survey, with recommendations.

Observations on the biology and physiology of wireworms of the genus Agriotes Esch., A. C. EVANS (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 235–250, illus. 10*).—It is shown by studies of wireworms kept at a constant temperature of 15° C. for 3 yr. and at natural soil temperatures for 2 yr. that small individuals grow rapidly and molt frequently, but that large ones grow slowly or remain constant in weight and molt infrequently. A basic pattern to account for this decreasing frequency of molting is presented. Studied in detail throughout the season, definite peaks in feeding activity and molting frequency were observed; a suitable method for analyzing such activity was found by dividing the population into groups on a basis of the number of annual molts. Increase in dry weight gave a more valid estimate of growth than increase in fresh weight. The rate of growth was strongly influenced by the food; wheat and carrots, e. g., permitted rapid growth, grass and clover gave smaller growth, mustard and potato allowed the wireworm to maintain its weight, and flax actually caused a decrease in dry weight. In a field test, the type of crop grown after breaking up the old pasture had a distinct effect on the wireworm damage to the following cereal crop. Beans reduced the population to a level at which a very successful crop was grown, and better yields were also obtained after wheat and grass. The wireworm cuticle is permeable to water, and it is shown that in relation to soil moisture this insect may be regarded as an osmotic system. The pF (suction force) scale of soil moisture proved of value in expressing the soil-moisture relations of wireworms; they feed more actively in moist than in dry or wet soil.

A note on Lecontella cancellata Lec. (Coleoptera: Cleridae) in cells of the mud-daubing wasp, P. RAU (*Ent. News, 55 (1944), No. 8, p. 197*).—A note on this beetle as an example of a border-line species between predatism and parasitism, with the weight of evidence in favor of the latter.

Observations on Comperiella bifasciata, an endoparasite of diaspine coccids, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 3, pp. 365–371, illus. 1*).—The encyrtid *C. bifasciata,* in its relation to the California red scale, consists of two host-determined races; one is able to reproduce for generations on this scale, whereas the other is unable to do so because of its low fecundity on this host. As shown by cross-breeding, the capacity to develop in the red scale is a maternal effect. The developmental rate of *C. bifasciata* during its first instar varied with the developmental condition of the host at the time of attack. The ♀ host proved susceptible to successful parasitism in all its instars; the ♂ host, only in the first instar. The parasite was not successful when it attacked the host in the second instar. Its minimum life cycle was 21 days at 80° F. The sexes were approximately equal in numbers. One or more crystalline rods in the midgut of the developing larva indicate a urinary function of the midgut.

The genus Lachnomyrmex, with the description of a second species (Hymenoptera: Formicidae), M. R. SMITH. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 8, pp. 225–228, illus. 2*).—On a new species of ant, *L. haskinsi,* from the Canal Zone.

Common spiders of Maryland, M. H. MUMA (*Baltimore: Nat. Hist. Soc. Md., 1943, pp. 173+, illus. 141*).—Following discussions of the general external anatomy of spiders, their ecology, taxonomy, and collection and preservation, the author of this semipopular manual takes up the individual species by families (with key), giving a description, pertinent comments, and the known Maryland distribution for each. A glossary and indexes to Latin and common names are provided.

Mites of the family Bdellidae, E. W. BAKER and J. W. BALOCK. (U. S. D. A.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 7, pp. 176–184, illus. 29*).—This paper is the first of a series on this family of predaceous prostigmatic Acarina; 7 of the 10 species described are new.

The life history of the tick Ornithodoros coriaceus Koch (Argasidae), C. N. SMITH. (U. S. D. A.). (*Ann. Ent. Soc. Amer., 37 (1944), No. 3, pp. 325–335*).—Data are presented on the eggs, larvae, seven stages of the nymphs, and the adults of this tick.

Ixodes ozarkus n. sp. and Ornithodoros aquilae n. sp., with notes on O. talaje and O. kelleyi (Ixodoidea), R. A. COOLEY (*Jour. Parasitol., 30 (1944), No. 5, pp. 287–294, illus. 3*).—The two new species of ticks are described and the three species of *Ornithodoros* compared.

Relation of chemical constitution of some N-heterocyclic compounds to toxicity to Aphis rumicis, H. L. KING, D. E. H. FREAR, and L. E. DILLS. (Pa. Expt. Sta. et al.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 637–640, illus. 1*).—Pyridine and 36 related compounds were tested as contact insecticides against the bean aphid. In a series of 2–*n*–alkyl–pyridines, compounds with 5 or more C atoms in the side chain were much more toxic than those with short chains, toxicity increasing with the length of the substituent group. A series of 2–*n*–alkyl–6–methyl pyridines closely paralleled the results with the 2–*n*–alkyl–pyridines. A series of 4–*n*–alkyl–pyridines was more toxic than the corresponding 2–*n*–alkyl compounds. Normal or straight-chain alkyl compounds were generally more toxic than the branched chain isomers. Addition of an amino group to the pyridine nucleus increased the toxicity much more than that of a methyl group in the same position. Hydrogenation of 2 alkyl pyridines to the corresponding piperidines failed to increase their toxicity. Toxicity to plants generally paralleled aphicidal action.

Heliothis virescens as a pest of cotton, with notes on host plants in Peru, E. J. HAMBLETON. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5,, pp. 660–666*).—The tobacco budworm has long been known as a serious pest in the tobacco sections of Florida, Georgia, Alabama, and Louisiana, but only within the past 10 yr. have observations shown its increasing importance as a cotton pest. Thus far there is no evidence to justify the hypothesis of a distinct biological race of the insect as a possible explanation for its comparatively recent destructive occurrence on cotton. Possibly a better interpretation of the fact could be gained from studies in localities where the insect is a pest of cotton, in order to determine its food plants other than cotton, the ecology of the areas where cotton is cultivated, and the role natural enemies play in effecting changes over a period of years. Data are presented and discussed in detail regarding the occurrence of the pest on cotton in Brazil and Peru and its host plants in the latter country—some 18 species including such common crop plants as flax, tomato, beans, and squash being listed with accompanying notes.

Laboratory technique for testing insecticidal dusts for pea aphid control, C. E. DIETER, R. L. JANES, H. F. WILSON, and H. L. BURDICK. (Univ. Wis.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 646–651, illus. 2*).—Regardless of the technics in evaluating insecticides, considerable error may occur even with the greatest care in procedure. A method is presented which, with the needed equipment for testing insecticidal dusts against the pea aphid, has been found highly satisfactory over a 5-yr. period. Details are given for the production of plants for aphid rearing and testing, for rearing the aphids, for preparation of the dust mixtures, and for the apparatus and technic of applying them. The accuracy of the testing method is discussed and examined by analyses of variance.

Strength of rotenone dust mixtures and rate of application in pea aphid control, J. E. DUDLEY, Jr., and T. E. BRONSON. (U. S. D. A. coop. Wis. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 643–646*).—Two years' field tests brought the following conclusions: With an oil-conditioned rotenone-bearing dust mixture, the quantity of rotenone applied per acre governs—within limits—the resulting kill. With as much as 0.3 lb. of rotenone applied per acre, it makes little difference whether a dust mixture of high rotenone content at a low rate or one with lower content at a higher rate is used. When, however, only 0.15 lb. or less of rotenone per acre is used, a dust mixture of high rotenone content at a low rate is preferable to one of low content at a high rate. A marked decrease in pea aphid kill occurs in an oil-conditioned dust mixture when the rotenone content is decreased from 0.375 to 0.25 percent or lower. It is concluded from 1943 results that when either 0.15 or 0.3 lb. of rotenone is applied per acre, a decrease in the rotenone content of the dust may be partially compensated for by an increase in the rate of application, but that this relationship fails to hold true when only 0.075 lb. of rotenone per acre is applied with dust mixtures of the rotenone contents used.

Effect of Empoasca solana on sugarbeets grown for seed, O. A. HILLS, V. E. ROMNEY, and K. B. MCKINNEY. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 698–702, illus. 2*).—Sugar beet seed production in outdoor cages at Phoenix, Ariz., was materially reduced by a small green leafhopper, *E. solana* DeL. There also seemed to be a tendency for this insect to cause slight increases in the proportion of small seeds, though in no case was there any appreciable reduction in their viability. These facts, together with observations on the plants involved and on the habitat of the insects under both field and cage conditions, led to the conclusion that this leafhopper feeds largely on the vegetative parts of the plants and that the damage attributable to it is mainly from devitalization of its host. In no case was there evidence of a diseased condition or toxic effect from infestation.

Two important wheat pests, F. R. PETHERBRIDGE and J. H. STAPLEY (*Agriculture, Jour. Min. Agr. [Gt. Brit.], 51 (1944), No. 7, pp. 320–324, illus. 1*).—On damage (1944) to winter wheat in England by the wheat bulb fly *Leptohylemyia coarctata* and the wheat shoot beetle *Helophorus nubilus.*

Studies of fluctuations in insect populations.—XI, The interrelationship of the wheat blossom midges and their host plant, H. F. BARNES and J. W. WEIL (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 231–234, illus. 2*).—According to studies amplifying previous findings on the wheat midges *Contarinia tritici* Kirby and *Sitodiplosis mosellana* Géhin (E. S. R., 86, p. 214; 88, p. 370), at date of wheat blossom midge emergence in an insectary some distance away from the growing wheat can give as reliable an estimate of the forwardness of the crop as field observation of the date of ear emergence. The percentage of grain attacked by these midges—which can be assessed by routine workers without special experience with wheat—can give an early and useful first estimate of the crop yield.

Uma lepidobroca da couve [A webworm infesting cabbage], O. MONTE (*Biológico, 10 (1944), No. 5, pp. 141–144, illus. 6*).—On injury to cabbage by larvae of the pyralid moth *Hellula phidilealis* Walker and on the biology and control of the pest.

Mercury substitutes for cabbage maggot control, L. E. Dills, D. E. H. Frear, and H. L. King. (Pa. Expt. Sta.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 640–642*).—Field tests on radishes were made with 36 different treatments with 22 materials, including several chlorinated hydrocarbons, N-heterocyclic compounds, and a number of miscellaneous new substances. The best safe material tested for early use was a calomel-bentonite dust; the best late treatment was with dichloroethyl ether. The smallest percentage of infestation with maggots followed use of a dormant tar oil and 2-ethyl-pyridine sulfate dust at 10 percent, but plant injury was very severe. Several of the other pyridine derivatives proved effective in control, but with considerable plant injury. Preliminary tests indicated that some of these treatments preventive of maggot damage but causing injury to radishes could be used safely on cabbages.

Treatment of unstaked tomato crops: Economic control of mite and caterpillars demonstrated, A. H. Friend (*Agr. Gaz. N. S. Wales, 55 (1944), No. 10, pp. 424–425*).—In the test reported (1944) payable returns were obtained from fall dusting with equal parts of sulfur and hydrated lime to control the tomato mite *Phyllocoptes lycopersici.* To take full advantage of this increased yield, growers are advised to apply lead arsenate for protection of the fruit from caterpillars, and also to control fungus diseases. This mite is said to have been the chief factor consistently tending to decrease yields of summer and later crops in New South Wales.

Effect of scraping and banding trees upon the numbers of transforming and hibernating codling moth larvae, H. Baker. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 624–628*).—In replicated plots in commercial orchards it was shown (1938–40) that estimates of the percentage of catch of larvae in bands varied widely according to the basis on which they were made; the one based on the number of larvae developing is believed to indicate more accurately than the others tried the actual extent of the effect of banding on codling moth populations. Under Missouri River Valley conditions, there was a very heavy mortality between the time the insect left the fruit as a mature maggot and the time when it emerged as a moth or entered hibernation. Nearly as many larvae transformed and developed into moths as entered hibernation on the check trees, more did so on the scraped trees, and still more—not counting those on the bands—on the trees that were both scraped and banded. Scraping—and to a greater extent when combined with banding—effected material reduction both in numbers of larvae developing into moths and in numbers entering hibernation. Of all larvae leaving the fruits during the 3 yr., 35.2 percent of those on the check trees developed into moths or entered hibernation, whereas 20.7 percent did so on the scraped trees and only 13.9 percent on those both scraped and banded. The effect of banding on moth emergence and larval hibernation was much greater than that indicated by the percentage of the larvae leaving the fruit and caught in bands. Transforming larvae were found to cocoon in largest numbers in the lower third of the trees and under bark, in crotches or forks of limbs, or in pruning or other scars.

A dust experiment for codling moth control in a heavy infestation, M. M. Barnes. (Cornell Univ.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 620–623*).—Three dusts—(1) 20 percent lead arsenate, 20 percent Black Leaf 155, and 60 percent Micronized Dusting Sulfur; (2) the same proportions of the first two, with a proprietary diluent; and (3) 20 percent lead arsenate, 10 percent Black Leaf 155, and 70 percent Micronized Dusting Sulfur—were applied in eight cover treatments to three Latin squares laid out in a relatively heavily infested orchard. In addition, all plots received two cover dusts of 20 percent lead arsenate and 80 percent Micronized Dusting Sulfur. Each application was from both sides and averaged 2 lb. 6 oz. per tree. Codling moth injury in the dusted plots was at 15–20 percent entrances, with about 30 percent stung fruit; in no case were differences between treatments significant; the figures for a representative untreated tree were about 58 and 17 percent, respectively. The results would indicate that a program of this type should be resorted to in similar infestations only if—from labor shortages or other conditions—it is not feasible to spray; in such cases a considerable reduction in damage may be expected from such a program. It is believed that an increase in the amount of dust per tree would result in improved control. None of the samples taken at harvest exceeded the domestic tolerance for residue of As_2O_3; this is thought largely attributable to the infrequency of dew when applications were made.

Repellency of pyrethrum extract and other materials to full-grown codling moth larvae, M. A. Yothers and F. W. Carlson. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 617–620*).—In tests conducted since 1936 on the lookout for a repellent against larvae searching for cocoon quarters, bands of corrugated paper impregnated with the test materials were placed half way around the trunks of apple trees and the repellent effects determined by comparing the numbers of larvae captured in contiguous treated and untreated bands at the end of 30, 60, and 90 days. Among some 250 formulas tried, best results followed the use of combinations of 5 percent pyrethrum extract with either 5 or 10 percent of cottonseed oil emulsified with blood albumin. Undiluted pyrethrum extract proved highly effective, but its action decreased with long exposure. Cottonseed oil undiluted was considerably less repellent, but its effects increased with longer exposure. Kerosene alone was neither repellent nor attractive and when used with pyrethrum extract reduced the effect of the latter. Dilutions of 1 percent dinitro-*o*-cresol—alone and with 10 or 20 percent cottonseed oil—appeared slightly attractive during a 30-day test but showed slight repellency over longer periods. Alone or plus cottonseed oil, nicotine sulfate (40 percent) at 1 percent dilution was at most only slightly repellent; stove oil at 10 percent was valueless.

Observations on the parasites of Cydia pomonella L. in southern France, F. J. Simmonds (*Sci. Agr., 25 (1944), No. 1, pp. 1–30, illus. 5*).—The species of parasites and predators attacking the various stages of the codling moth in southern France were reared and their biology was investigated. Experiments were set up to determine whether fruit in any particular part of a tree was more liable to attack by *Cydia* than another and whether at any part the degree of parasitism was higher. The influence of species of host tree on parasitism was likewise studied. The host preferences of one of the parasites, *Dibrachys cavus* Walk., were tested because of its peculiar behavior; it can be either ecto- or endo-parasitic, according to host. Secondary parasites are also considered. The degree of biological control is discussed, and recommendations are made as to which parasites should be shipped to Canada for codling moth control there.

Relation of mortality to amounts of hydrocyanic acid recovered from fumigated resistant and nonresistant citrus scale insects, D. L. Lindgren and W. B. Sinclair. (Calif. Citrus Expt. Sta.). (*Hilgardia [California Sta.], 16 (1944), No. 6, pp. 301–315, illus. 6*).—Resistance to fumigation with hydrocyanic acid gas (HCN) in the California red scale was first noted in 1914 and resistance in the black scale in 1915. Fumigation of nonresistant and resistant California red scale under laboratory conditions indicates that the resistant race, with the various concentrations and exposures tried, is more difficult to kill than the nonresistant. Any added increment of either concentration or exposure has a greater effect on the kill of the nonresistant than of the resistant red scale. A larger quantity of HCN is recovered from fumigated nonresistant than from fumigated resistant red scale. When red scale is killed by heat or lack of oxygen, and then fumigated, more HCN is recovered from the nonresistant than from the resistant race. With refumigated red scale previously killed by HCN fumigation but not dried up, more HCN is recovered from the resistant than from the nonresistant race. With red scale fumigated when dead and dried, equal amounts of HCN are recovered from the resistant and from the nonresistant race. More HCN is recovered from fumigated nonresistant than from fumigated resistant black scale.

More fumigation experiments: Absorption of hydrocyanic acid by resistant and nonresistant scales, D. L. Lindgren and W. B. Sinclair. (Calif. Citrus Expt. Sta.). (*Citrus Leaves, 24 (1944), No. 10, pp. 8–9, illus. 4*).

Absorption of HCN by resistant and non-resistant scale insects, D. L. Lindgren and W. B. Sinclair. (Calif. Citrus Expt. Sta.). (*Calif. Citrog., 29 (1944), No. 12, pp. 341, 356, illus. 4*).

Effect of soils, cover crops, and foliage on concentration of HCN in citrus fumigation, R. A. Fulton and R. L. Busbey. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 597–598, illus. 1*).—The loss of hydrocyanic acid gas through sorption by soils, cover crops, and citrus foliage proved negligible as compared with the probable initial loss through the tent fabric when the fumigant was released.

The citrus thrips, measures for its control, and their effect on other citrus pests, E. A. McGregor (*U. S. Dept. Agr. Cir. 708 (1944), pp. 12, illus. 7*).—This paper summarizes and brings up to date findings on the citrus thrips and its control. The influence of thrips control measures on other citrus pests is also discussed. Seven noteworthy illustrations supplement the text.

The bronze orange bug (Rhoecocoris sulciventris Stal.), a citrus pest of the North Coast, P. C. Hely (*Agr. Gaz. N. S. Wales, 55 (1944), No. 9, pp. 397–401, 406, illus. 4*).—This pest is reported to have caused injury to citrus trees in the area for many years and in 1943—following one of the severest winters on record—the populations reached enormous proportions, in some orchards practically ruining the crop as well as seriously weakening and defoliating the trees. Furthermore, an appreciable amount of injury and discomfort was caused to persons working among infested trees owing to the corrosive fluids ejected by the bugs which caused severe irritation to membranes and skin. Of some 50 materials tried against the pest, soft soap showed up to advantage as to both cost and effectiveness.

Two new aphids from rhododendron and related plants (Homoptera: Aphididae), A. N. Tissot and J. O. Pepper. (Fla. Expt. Sta. and Pa. State Col.). (*Fla. Ent., 27 (1944), No. 2, pp. 21–33, illus. 21*).—On *Amphorophora rhokalaza* and *A. kalmiaflora* n. spp.

The relation between host condition and attacks by the bronzed birch borer, R. F. Anderson. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 588–596, illus. 4*).—This borer is not a very aggressive subcortical feeder and can develop successfully only in extremely decadent trees. Data presented indicate that the adults are attracted to and attack the suppressed, girdled, or topped-and-felled quaking aspen and paper birch trees, those most decadent being most suited to attack. These were trees that had stopped producing radial increment. Decadent trees that were still growing in diameter (suppressed trees and portions of the stem above the girdle on recently girdled trees) were only slightly attackd. The evidence submitted shows that even the poorest of the growing trees were unsuited to development of the larvae; on the other hand, trees dead so long that the phloem tissues were brown also proved unsuited. The findings suggest that whenever this borer is found in dying trees it should not be considered the primary cause of death until all other possible factors have been evaluated.

Investigations of the flour beetles of the genus Tribolium.—III, A colour strain of T. castaneum (Hbst.), L. W. Miller (*Jour. Dept. Agr. Victoria, 42 (1944), No. 10, pp. 469–471*).—A continuation (E. S. R., 92, p. 246). Adults of this new strain—found in Victoria in 1943—are dark brownish-black to black, the normal color being reddish-brown. Crosses between the two strains revealed that the color is apparently due to a single factor. On a nutritive diet, larvae of the normal "red" strain developed more rapidly than those of the "black" strain; on a less nutritive diet the reverse was the case. It is suggested that this result may be due to differences in sensitivity to a B-vitamin deficiency, the normal red strain being the more sensitive.

Relation of chemical constitution of some N-heterocyclic compounds to toxicity against Tribolium confusum, H. L. King and D. E. H. Frear. (Pa. Expt. Sta. et al.). (*Jour Econ. Ent., 37 (1944), No. 5, pp. 634–637, illus. 1*).—Tests of 17 salts of various pyridine derivatives were made against adults of the confused flour beetle. Results with a series of alkyl pyridine sulfates indicated that salts with short side chains were more toxic than those with long ones. The toxicity of these compounds appeared due largely to the material ingested rather than to contact action. A series of alkyl pyridine copper chloride double salts seemed to be completely repellent to the beetles. Results with 3 other salts of 4-*n*-propyl-pyridine indicated that the picrate, salicylate, and the zinc chloride double salt were slightly toxic or partially repellent, or both.

Natural sources, habitats, and reservoirs of insects associated with stored food products, E. G. Linsley (*Hilgardia* [*California Sta.*], *16 (1944), No. 4, pp. 185–224*).—According to the author, stored-products insects share biological characteristics which have affected their wide distribution and made them pests. Apparently these insects tolerate more extreme conditions of temperature and humidity than many less widely distributed forms. Many can survive in foodstuffs with a moisture content far below the optimum. Further, man usually provides optimum conditions in buildings, warehouses, and food-storage units. Certain of these insects include in their diet the majority of dry food and drug products of plant and animal origin, exhibiting a wider food range than that generally attributed to most other insects. Nearly all the species reproduce almost continuously under favorable conditions and require no winter diapause. Adults are often long-lived and may reproduce over a period of years, and some of the most important species can survive for long periods without food, permitting transportation in the absence of suitable food. Finally, most of them are small-sized and can remain undetected until a large population has been built up. Several (Bruchidae, *Sitophilus* spp., *Sitotroga* spp.) naturally infest seeds and have become pests without evolution of food habits. Many (Cryptophagidae, Mycetophagidae, Lathridiidae, Acaridae) are actually fungus feeders and seek out molds and fungi in foodstuffs. In nature these species live under bark, in nests of birds, mammals, and insects, or in decomposing plant materials. Many general scavengers on dead plant materials will infest stored products—chiefly moths (phycitids, pyralids) but also anobiids and nitidulids. Scavengers or semipredators living under bark have also become pests—including Tenebrionidae (flour beetles, mealworms), Cucujidae, and Ostomatidae. Wood borers include Ptinidae, Anobiidae, Bostrichidae, and Scolytidae. Insect nests have contributed several of the Galleriidae, Phycitidae, Ptinidae, and Dermestidae. The pollen stored by bees may have influenced evolution of food habits and served as a bridge between zoophagy and phytophagy. Many species associated with stored food products are predators and parasites of other insects present. Of these, Histeridae, Corynetidae, and Anthocoridae are probably attracted to the products and habitat directly rather than by specific insects present. Primary natural reservoirs of stored food products pests are bark and decomposing wood; nests and food caches of other insects, especially bees, wasps, and ants; and nests of birds and rodents.

A list of 165 literature citations is appended.

Sulfur dioxide-acetone as a household fumigant, E. M. Swisher. (Ohio State Univ.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 694–697, illus. 1*).—The fault with SO_2 as a household fumigant is said to lie mainly in the ordinary methods of application. When combined with acetone it forms a liquid that is stable when confined but readily decomposes into its component parts on exposure to air under standard conditions. The molecular weight and 1 : 1 by volume ratios of SO_2-acetone were both found to be good household fumigants, are conveniently handled as liquids, and are less flammable than HCN. These mixtures of SO_2-acetone could be packaged conveniently and applied for the evolution of SO_2 in household and other fumigations. The new method of application greatly reduces or eliminates most of the objectionable qualities of SO_2, outmoding the practices of generating the gas on the job or the use of heavy returnable cylinders; it should promote the use of the compound, especially against bedbugs in dwellings.

Trichloracetonitrile as a fumigant, H. H. S. Bovingdon and F. P. Coyne (*Ann. Appl. Biol., 31 (1944), No. 3, pp. 255–259*).—In determinations of the reactions of this fumigant on various insects infesting stored products and houses, the toxicity was found to be increased by adding 10 percent or more of CO_2. In the fumigation of bulk-stored wheat trichloroacetonitrile compared favorably with ethylene oxide. Its phytocidal action on seed wheat at doses which might be used in practice was not serious and the vitamin B_1 and riboflavin contents of wheat were not affected, but it proved highly toxic to growing plants. The possibility of its use in fumigating dried fruit was demonstrated.

Persistence of D. D. T. in oil-bound water-paint, G. A. Campbell and T. F. West (*Nature [London], 154 (1944), No. 3912, p. 512*).—A preliminary note on tests demonstrating that oil-bound water paint incorporated with DDT was effective against houseflies and had not lost its insecticidal properties after 2 mo.

The persistence and termite resistance of creosote and its constituent fractions, P. J. A. Loseby and P. M. D. Krogh (*Jour. So. African Forestry Assoc., No. 11 (1944), pp. 26–32, illus. 2*).—When small blocks of *Pinus insignis* sapwood treated full-cell by submersion in a creosote of South African manufacture and in its constituent fractions were exposed to atmospheric conditions for 5.5 yr., the amount of creosote lost by evaporation and solution was 47 percent, whereas losses of its fractions varied from 91 percent for that distilling below 270° C. to none for the residue above 355°. The loss of creosote from treated wood blocks is compared with that from open dishes. A similar set of blocks was buried at the site of the International Termite Test at Pienaar's River, Transvaal; the fractions distilling above 315° appeared to give the greatest protection.

The influence of color and finish on the attractiveness of papers to thysanurans, H. L. Sweetman, F. E. Morse, and W. Wall. (Mass. State Col.). (*Pests, 12 (1944), No. 10, pp. 16, 18*).—The firebrat was found to be definitely attracted to certain colors of wallpaper—particularly orange—but not for feeding purposes by the color; green paper was not attractive. The whole-wheat paste powder used for sticking the paper proved an attractive food to thysanurans, but these insects did not penetrate the face of the paper because of the paste on the back. Certain wallpapers may attract them for feeding because of the paper proper, but much more frequently the adhering paste, the sizing, or the dye ingredients are the stimulating substances. A number of other types of paper—some of which lacked sizing—were more attractive to thysanurans than a wallpaper. Newspaper and a brown wrapping paper, however, offered little attraction as food and were good protecting materials when several layers thereof were tightly wrapped about articles likely to be damaged by this group of insects.

Mosquito survey activities at Camp Peary, Virginia, C. K. Dorsey (*Ann. Ent. Soc. Amer., 37 (1944), No. 3, pp. 376–387*).—For the type of survey conducted

(1943), each of the four methods of collecting adult mosquitoes—light traps, house traps, barrel traps, man—proved useful and each supplemented the others. When storage batteries must be used to operate light traps, the heavy duty type should be employed. The operation of light traps on bright moonlight nights failed to give an accurate indication of the mosquito population. For successful operation of barrel traps, it is essential that they be located in carefully selected sites and that they simulate as nearly as possible a hollow log. In collecting mosquitoes from man at night, satisfactory results were obtained by having the victim strip to the waist. Adult mosquitoes were most prevalent during June-July; it is believed that adverse (dry) weather condition in August 1943 caused them to be less numerous than usual during that month. The 1943 records indicated that the active breeding season in this locality begins in April and continues through October; these dates coincide very well with the 10-yr. average dates of killing frosts in spring (April 9) and fall (October 31) for this region. By planning mosquito control activities accordingly, optimum results can be expected. In general, the distribution of mosquito larvae was similar to that observed by other workers. The presence of one or more species of larvae definitely associated with larvae of disease-carrying mosquitos, in particular types of breeding locations, can be recognized as an indication of the necessity for mosquito (species) control. The data presented are not regarded as finally conclusive, since they are the results of only one season's activities.

The rearing of sterile adult Anopheles, M. A. BARBER (*Pub. Health Rpts. [U. S.], 59 (1944), No. 42, pp. 1384–1387*).—The method involves culture of these mosquitoes in workable quantities in a liver extract-yeast medium in the presence of a single species of ciliate.

Control of Aedes aegypti in Savannah, C. A. HENDERSON (*Pub. Health Rpts. [U. S.], 59 (1944), No. 41, pp. 1350–1352*).—The results of an inspection and follow-up campaign, together with an intensive educational program, proved so successful that it is believed a permanent control program is economically sound and should be continued after the present emergency has passed. The general improvement of sanitary conditions alone proved well worth the cost involved.

Studies on mosquitoes from the Philippine Islands and Australasia (Diptera: Culicidae), A. STONE and R. M. BOHART. (U. S. D. A. et al.). (*Ent. Soc. Wash. Proc., 46 (1944), No. 8, pp. 205–225, illus. 14*).—"This paper is presented to make the names of eight new species and two new subgenera available for those engaged in mosquito work in the Pacific area, and to point out characters that will separate species which have been confused in the past." Identification keys are provided.

New culicine mosquitoes from the Philippine Islands (Diptera: Culicidae, R. M. BOHART and S. D. FARNER (*Biol. Soc. Wash. Proc., 57 (1944), pp. 69–73, illus. 15*).—Four new species are described.

The relation of particle size to the effectiveness of paris green used in airplane dusting for mosquito control, R. L. METCALF and A. D. HESS (*Pub. Health Rpts. [U. S.], 59 (1944), No. 45, pp. 1458–1465, illus. 3*).—Previous studies have shown that in airplane dusting against larvae of the common malaria mosquito an average of about 75 percent of the paris green dust drifts away from the treatment area because of fine particle size. Laboratory tests indicated that the average maximum diameter of particles ingested by first to fourth instar larvea were 29μ, 51μ, 68μ, and 106μ, respectively. The median lethal dose of paris green to fourth instar larvae was 0.05 mg. per gram of body weight, or the equivalent of a particle about 40μ in diameter. Toxicity tests with fourth instar larvae showed no significant difference between paris green particles 1μ or less in diameter and those 50μ–75μ in diameter. A special paris green having a particle size analysis of 84 percent by weight with 20μ–50μ in diameter was compared by airplane dusting with standard paris green which had 48 percent by weight in this size range. Use of the coarse dust resulted in a 60 percent increase in the amount of dust reaching the treatment area. Field tests with the coarse dust under average conditions gave a larval kill of 90–100 percent. Manufacturing costs for the large dust were no greater than for the standard. It is therefore believed that specifications for paris green to be used in airplane dusting should be revised to encourage production of a material with more desirable particle size composition.

Observations on the biology of the stablefly in Florida, S. W. SIMMONS. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 680–686*).—The minimum incubation period of eggs tested at 28° C. was 19 hr. and the maximum 120 hr.; the mean minimum was 39.65 hr., the mean maximum 65.1 hr., and the calculated arithmetic-mean incubation period 52.3 hr. In Richardson's medium at 30°, first instars were found at 1–80 hr., second instars at 44–144 hr., and third instars at 97 hr. up to pupation. The developmental period was longer during midwinter, even at summer temperatures. In a fresh bay-grass medium development was as rapid as in Richardson's medium. The mean minimum pupal period was 6.55 days at 28°–32° and the longest period was encountered during midwinter; during April–June the mean minimum was only 5.8 days. Some adult flies captured in nature and fed on citrated beef blood lived as long as 47 days, but most of them died earlier. The minimum pre-oviposition period found was 8 days; the mean, 10.6 days. Feeding stableflies often punctured the skin of their host several times before drawing blood; once blood was found, engorgement occurred in 1.5–8 min. Tests at Sarasota, Fla., showed that under semifold conditions this fly fed on man more readily in the morning and late afternoon and became sluggish during the midday heat. Bay grass isolated for 7 days before oviposition was permitted produced less than half as many adult flies as when infested green. Grass initially exposed to flies after 14 days' isolation produced only about 20 percent as many flies as when exposed green; after 21 days' isolation, emergence dropped to 3.21 percent. Thus uninfested grass as old as 21 days need not be treated to control subsequent fly breeding. Third instars overwintered in peanut litter in northwestern Florida. Slow development occurred throughout the winter and large numbers of flies emerged during warm periods. The cycle from egg to adult may be as short as 13 days or—under adverse conditions—it may require several months.

The repellency of a pyrethrum-thiocyanate oil spray to flies attacking cattle, D. E. HOWELL and F. A. FENTON. (Okla. A. and M. Col. et al.). (*Jour. Ent., 37 (1944), No. 5, pp. 677–680, illus. 2*).—Lethane— an oil base cattle spray with 6 percent toxicants including pyrethrum and two grades of a thiocyanate—applied to cows at 0.5, 1, and 2 cc. per 3.23 sq. ft. of body surface was repellent to the horn fly up to 10.5 hr. after spraying. Similar application rates were less repellent to the stablefly, both as to amount and duration; little repellency against this pest was noted after 4–5 hr. following treatment. As the time after spraying increased, the amount of repellency to both pests decreased. In parallel tests, 2 cc. of spray per 3.23 sq. ft. of surface was more repellent to the horn fly than 0.5 cc. for 7 hr. after the morning treatment; at other times no significant differences were noted. The heavier application was more repellent to the stablefly for only 4 hr. after the morning spraying and for 2 hr. after the evening spraying. The horn fly infestation was greater in the morning than during the afternoon; the stablefly infestation was greatest in the evening.

Screwworm survey of the Southeastern States in 1943, W. G. BRUCE. (U. S. D. A.). (*Jour. Econ. Ent., 37 (1944), No. 5, pp. 687–689, illus. 1*).—This survey revealed widespread infestation in Florida, Georgia, and Alabama, reaching outbreak proportions in peninsular Florida and southern Georgia with considerable loss of livestock. Favorable climatic conditions, together with the shortage of experienced farm labor and unavailability of effective remedies, contributed to the rapid build-up and spread of the pest. The incidence and relative abundance of screwworms throughout the Southeastern States were determined, and a fair estimate was obtained of needed critical insecticides. Furthermore, the survey insured proper distribution and conservation of these insecticides and aided in reducing infestations and attendant losses.

The cattle grub problem in North Dakota, J. A. MUNRO (*North Dakota Sta. Bimo. Bul., 7 (1944), No. 1, pp. 7–9, illus. 1*).—A practical account.

The Triatominae of North and Central America and the West Indies and their public health significance, R. L. USINGER (*U. S. Pub. Health Serv., Pub. Health Bul. 288 (1944), pp. 83+, illus. 64*).—This monographic study treats of the history of triatomine bugs and of their relation to Chagas' disease (including other vectors), biology, host relations, geographic distribution, and systematics. A six and one-half page bibliography and a systematic index are included.

Food habits of several species of poultry lice with special reference to blood consumption, C. M. CRUTCHFIELD and H. HIXSON. (Univ. Fla.). (*Fla. Ent., 26 (1943), No. 4, pp. 63–66*).—The barbs and barbules of feathers and blood were found to comprise the food of the chicken body louse as well as of a species of the genus hitherto unrecognized as a poultry pest in the United States. These species obtain blood by gnawing through the epidermis and rupturing the quill of pin feathers. The diet of the shaft louse *Menopon gallinae* consists of barbs and barbules; that of the wing louse *Lipeurus caponis,* of hooklets of the flight feathers and occasionally barbs and barbules. The large chicken louse and the fluff louse feed largely on barbs and to some extent on barbules.

Uses of DDT on the poultry farm, D. O. WOLFENBARGER and E. HOFFMANN. (Del. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 545–546*).—Spraying the ceilings and walls of a poultry house resulted in striking control of the housefly. In trials of phenothiazine, thiourea, borax, and DDT as larvicides against the housefly and a fly identified as *Themira putris* (L.), DDT proved equal to the first and superior to the others, reducing the number of flies emerging by 90 percent over the untreated control.

Concerning colony temperatures, V. G. MILUM (*Iowa State Apiarist Rpt., 1943, pp. 57–61, illus. 1*).—A general discussion of honeybee colony temperatures—the proper limits and means of obtaining them—on the basis of the author's experimental work and with reference to studies by others.

Life of bees in winter, M. H. HAYDAK. (Minn. Expt. Sta.). (*Amer. Bee Jour., 84 (1944), No. 10, p. 346*).—The author briefly summarizes his observations on the life of honeybees in winter, since any information along this line has a very important bearing on the problem of wintering; "the more we know about this life, the easier it will be for us to help the bees go through the hardest period of their fight for existence with the smallest loss."

Our winter problems, E. J. ANDERSON. (Pa. Expt. Sta.). (*Gleanings Bee Cult., 72 (1944), No. 10, pp. 433–435, 467, illus. 3*).—Factors having a direct bearing on the ability of a colony of bees to survive are not only many but are complicated by the fact that each winter presents a different combination of conditions. Research work in Pennsylvania emphasizes the value of the following recommendations: Use only the best acclimated stock, winter the bees on a large amount of good quality food, pack the bees in colder climates, provide wind protection the year around, give each hive a top entrance, and use good beekeeping practices in fall and spring.

The food of the honeybee, M. H. HAYDAK. (Minn. Expt. Sta.). (*Iowa State Apiarist Rpt., 1943, pp. 68–72*).—An address presenting the present status of nutrition in the honeybee, based on studies by the author and others.

The chemical composition and nutritional value of pollens collected by bees, A. E. Vivino and L. S. Palmer. (Minn. Expt. Sta.). (*Arch. Biochem., 4 (1944), No. 2, pp. 129–136*).—Pollens collected by honeybees from dandelion, certain fruits, clovers, and fall flowers were found to possess high nutritive values. The concentrations of Ca, P, Mg, Fe, and Cu compared favorably with those of a number of plant foods, the Cu content being exceptionally high. The pollens proved to be good sources of pantothenic acid, niacin, thiamine, riboflavin, and ascorbic acid and also contained small amounts of vitamins E and D. The water-soluble vitamin concentrations of bee-collected pollens were as high as in a number of the better food sources of these respective factors; vitamins K and A were absent. Pollens collected by bees from the above sources contained an abundance of carotenoids and flavones; anthocyanins and chlorophylls were absent. The mean protein content of the bee-collected pollens studied compared favorably with that of common beans, peas, and lentils. When the ether-extracted mixed pollens were fed to rats as the sole source of protein at about a 22-percent level—the diet otherwise being complete—indications were that certain dietary indispensable amino acids—notably tryptophan and methionine (or cystine)—were not present in optimum amounts for their normal growth.

The possibility of making red clover a satisfactory source of nectar, J. N. Martin. (Iowa State Col.). (*Iowa State Apiarist Rpt., 1943, pp. 48–50, illus. 1*).—Although red clover depends on insects for pollination, the well-known barrier of flower tube length that puts the nectar beyond the reach of honeybees is the one feature preventing it from being on a par with alsike and white clovers for bee pasture. Honeybees were found to frequent short-flowered strains of red clover much more freely than the common strains. Studies over a period of years by the Iowa Experiment Station indicated that there are at hand in that State suitable short-flowered strains; it only remains to select and isolate them.

Honeybees increase clover seed production 15 times. (Ohio State Univ.). (*Iowa State Apiarist Rpt., 1943, pp. 51–53*).—On the basis of experimental results, it is recommended that farmers located near honeybee colonies make a special effort to grow legume seed. Those wishing to grow clover seed but needing honeybees near their fields may be able to induce commercial beekeepers to supply the bees by offering free apiary sites. Farmers are encouraged to own as large a number of colonies as they can profitably operate.

Honeybee pollination and fruit production, R. L. Parker. (Kans. State Col.). (*Iowa State Apiarist Rpt., 1943, pp. 54–56*).

La polinizacion de los frutales por la abeja [Pollinization of fruit trees by bees], F. M. Croce ([*Argentina*] *Min. Econ., Obras Pub. y Riego, Dir. Indus. y Fomento Agr. Bol. 28 (1942), pp. 77, illus. 19*).

ANIMAL PRODUCTION

Livestock improvement in China, R. W. Phillips (*Chungking: Min. Agr. and Forestry, 1944, pp. 160+, illus. 11*).—The three main divisions of this report cover (1) existing types, conditions, and practices, (2) methods of breeding for improvement, and (3) organizations best adapted to livestock improvement in China.

Smoked meats, II, III (*Canad. Jour. Res., 22 (1944), No. 5, Sect. F, pp. 97–106, illus. 1; pp. 107–118*).—A continuation of the series (E. S. R., 88, p. 516).

II. *Development of rancidity in smoked and unsmoked Wiltshire bacon during storage,* W. H. White.—The relative effects of smoking bacon on spoilage were investigated by smoking one-half of four bacons stored at 0°, 15°, 30°, and 45° F., with the other half stored at these temperatures without smoking, as in previous studies in this series. These results showed that smoked bacon may be satisfactorily stored for at least 2 mo. at 0°–30°, whereas unsmoked bacon was usually rancid after 1 mo., but spoilage due to the formation of excessive quantities of free fatty acids was of little importance. The effect of size of the piece smoked was investigated by making studies of the peroxide oxygen formation in the fat of the cuts of whole backs of smoked and unsmoked carcasses, each back of eight hogs being divided into six pieces, one-half of the backs smoked and the other half unsmoked. Peroxide oxygen determinations were made up to 98 days. The differences at various storage temperatures were small, but it was evident that greater peroxide oxygen formation occurred at the higher temperatures of storage. The greatest increase in free fatty acid formation occurred between 21 and 42 days' storage.

III. *Effect of maturation period on quality,* W. H. White, A. H. Woodcock, and N. E. Gibbons.—Maturation periods of 1–25.5 days at 30° prior to smoking at 140° showed that no consistent effects were apparent in flavor tests, surface bacterial growth, peroxide oxygen formation in the fat, and changes in color and color stability of the lean meat during storage periods at 30°. These differences were usually small and showed no consistent trend. The maturation period of 10–15 days seemed most suitable.

Chewings fescue seed as a feedstuff, D. WHITSON, N. R. ELLIS, and C. A. CABELL. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6, pp. 544–545*).—Similar gains and gains per unit of feed consumed were produced by chicks on a controlled wartime ration and rations which consisted of 30 percent ground Chewings fescue seeds or 30 percent oats to 4 weeks of age. Satisfactory growth and no abnormalities occurred in rats on the Chewings fescue ration.

Commercial feeding stuffs—report on inspection, 1943, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 480 (1944), pp. 143–230*).—The usual report (E. S. R., 90, p. 817) of the guaranteed and found analyses of 846 samples of feeding stuffs, including 42 samples of vitamin D carriers officially examined and 73 biological specimens examined for the presence of toxic materials in 1943.

The cattle of Britain, F. H. GARNER (*London and New York: Longmans, Green & Co., 1944, pp. 158, illus. 60*).—An account is given of the development of the cattle industry and its importance in Great Britain, with descriptions of various dairy, beef, and dual-purpose breeds. Financial aspects and the effects of the war on the cattle industry are discussed.

The Iberia heat tolerance test for cattle, A. O. RHOAD. (U. S. D. A.). (*Trop. Agr. [Trinidad], 21 (1944), No. 9, pp. 162–164*).—Data on the body temperature and pulse rate of 198 cattle placed in the sun shortly after sunrise and kept there throughout the day showed the effects of solar radiation on heat production in the cattle. Environmental conditions such as temperature were recorded. The cattle subjected to the solar radiation represented grades and purebreds of the Brahman, Angus, Santa Gertrudis, and Africander cattle. The adaptability coefficient devised as 100 — [10 (*BT* — 101.0], in which *BT* is the average body temperature obtained under the conditions of the experiment, served to indicate the ability of the animal to withstand the heat. Purebred Brahmans had the highest heat tolerance, with a coefficient of 89. Both the ½ Brahman × ½ Angus and the ⅜ Brahman × ⅝ Angus had a coefficient of 84. The respiration rate of the halfbreds was only 55 per minute, as contrasted with 61 by the ⅜ Brahman × ⅝ Angus; therefore the former cross was considered the more heat-tolerant.

The value of distillers' rye dried grains in the wintering rations for pregnant ewes, 1939–40—1940–41, J. B. OUTHOUSE, F. H. LEINBACH, and D. MEADE (*Maryland Sta. Bul. A32 (1944), pp. 10+*).—In two experiments with pregnant Hampshire ewes, distillers' rye grains, which were satisfactorily used for steers (E. S. R., 89, p. 469), did not give satisfactory results when substituted for shelled corn or for shelled corn and part of the clover-light timothy mixed hay used in these trials. The winter feeding periods lasted from November 1, 1939, to May 9, 1940, and from November 21, 1940, to April 10, 1941. The ewes were divided into three uniform lots, with all ewes shifted to different lots in the second trial. The ewes maintained their weights until lambing, but on distillers' rye grains deaths occurred more frequently among ewes that lambed. Pregnant and lactating ewes were more seriously affected by the nutritional deficiencies than were growing and fattening ewes which were not pregnant. There was an average of three deaths in the lot receiving distillers' rye grains in place of shelled corn and part of the clover-timothy hay, with an average of 1.5 deaths in the lot receiving distillers' rye grains in place of all of the shelled corn. The average final weights on these rations were also less than on shelled corn, cottonseed meal, mixed hay, and corn silage.

Cria de cerdos [Swine production], P. Aragón Leiva (*México: Ediciones Agr. Trucco, 1942, pp. 319, illus. 46*).—A comprehensive book on swine breeds and breeding, feeding, management, sanitation, diseases and parasites, and the processing of hog products.

Urine excretion by boars, W. W. Green. (Minn. Expt. Sta.). (*Amer. Jour. Vet. Res., 5 (1944), No. 17, pp. 337–340*).—Urine samples from boars of different ages from 10 to 76 weeks ranged from 0 to 15,600 cc. and averaged 4,287 cc. for 48 hr. The amounts of urine seemed to be associated more with age than with season. There were significant differences between inbred lines in the amount of urine secreted in a crate specially prepared for catching it.

Riboflavin deficiency in swine, with special reference to the occurrence of cataracts, M. M. Wintrobe, W. Buschke, R. H. Follis, Jr., and S. Humphreys. (U. S. D. A. et al.). (*Bul. Johns Hopkins Hosp., 75 (1944), No. 2, pp. 102–114, illus. 3*).—Following methods employed in previous investigations of components of vitamin B in the pig (E. S. R., 88, p. 799), signs of nutritional deficiency became apparent within 2–3 weeks in three pigs on a ration of vitamin-free casein, sucrose, lard, and a complete mineral mixture to which were added crystalline B vitamins—thiamine hydrochloride, nicotinic acid, pyridoxine hydrochloride, choline chloride, calcium pantothenate, inositol, and *p*-aminobenzoic acid. The animals failed to gain, their gait was unusual, they lost their tidy appearance, the hair coat became rough, dry, and thin, and there was a scaling and scabby formation of the skin. Lens opacities and other eye abnormalities were apparent in three pigs at ages varying from 112 to 156 days when riboflavin-deficient rations were fed. Litter mates receiving the same ration supplemented with riboflavin but no nicotinic acid exhibited no eye abnormality. Only one eye change was noted in 21 comparable pigs on standard rations. No lens opacity was found in 178 eyes of pigs killed in a local abattoir.

The nutritional requirements of the dog, L. Michaud and C. A. Elvehjem. (Wis. Expt. Sta.). (*North Amer. Vet., 25 (1944), No. 11, pp. 657–666*).—The requirements of the dog are discussed for the various carbohydrates, proteins, fat, minerals, and vitamins.

The minimum temperature for embryonic development in the domestic fowl (Gallus domesticus), E. M. Funk and H. V. Biellier. (Mo. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 598–540, illus. 1*).—Fresh-laid eggs from mated and unmated pens of White Leghorn hens, stored at variable temperatures, showed no development in fertile eggs below 76° ± 0.5° F. Blood rings did not develop at 80°.

The effect of artificial light on chicks brooded during hot weather, B. W. Heywang. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6, pp. 481–485*).—Since the slow growth of chicks brooded in hot weather noted by Kempster and Parker (E. S. R., 76, p. 676) may be due to reduced feed consumption, data were obtained from six experiments at the U. S. Southwest Poultry Experiment Station, Glendale, Ariz., in which groups of Single-Comb White Leghorn or Rhode Island Red chicks were subjected to artificial light from midnight to daylight in the first experiment, all-night lighting in the second experiment, and all-night or midnight-to-daylight lighting in the remaining experiments, with some groups receiving no light in each experiment. In one experiment of 10 weeks' duration and the others of 12 weeks, chicks receiving artificial light weighed more and had eaten more feed than chicks receiving no artificial light. However, there was no appreciable increase in feed consumption and live weight from chicks receiving artificial light all night instead of from midnight to daylight. The pullets receiving artificial light all night or from midnight to daylight weighed more when they were 16, 20, and 24 weeks old than those receiving no artificial light, but the weights of the pullets receiving artificial light all night were slightly less than those of pullets receiving artificial light from midnight to daylight. These differences had little or no effect on the age at first egg or the egg weight.

Relative body depth an exciting cause for development of keel bursae in chickens, S. Bird (*Sci. Agr., 24 (1944), No. 12, pp. 591–599, illus. 2*).—Study of the influence of the relative weight and pressure on the roost in the development of keel bursae in chickens showed that the incidence and severity in the fowl was largely dependent on the magnitude of the pressure and depth through the pectoral region relative to body weight. Crooked keels decreased the incidence and severity of the keel bursae by reducing the relative depth of the bird. Variations in the body weight from year to year caused variations in the incidence of this abnormality. Evidently keel bursae afford protection against more serious injury. It appears that freedom from bursae could be expected only in rapidly growing families of inherited shallowness of body. The relation of the bursae arbitrarily graded to the body weight in Barred Plymouth Rocks was ascertained in 1942 for 120 cockerels at 26 weeks of age and in 1943 for 99 males.

A note by V. E. Hollinsworth on measuring equipment, developed especially for measuring the pressure that a bird may exert through its keel when roosting, is included.

Protein in poultry nutrition, D. C. Hill (*Sci. Agr., 24 (1944), No. 12, pp. 551–590*).—A comprehensive review is presented of the literature on protein nutrition and amino acid requirements of chicks for growth and of hens for egg production and hatchability. The effects of plant and animal proteins and the role of each of the amino acids are discussed at considerable length. Protein requirements of turkeys, ducks, and pigeons, pheasants, and quail are taken up in separate parts of the article. A bibliography of 269 references on proteins for these classes of poultry is presented.

Lactalbumin as a protein supplement for growing chickens, W. H. Ott and R. V. Boucher. (Pa. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 497–506*).—Investigations of the growth-promoting properties of commercial lactalbumin in different combinations with meat scrap and with soybean meal were reported in six experiments.

In the first experiment the highest rate of growth and the highest feed efficiency were produced at 8 weeks of age on a ration containing 15 percent of lactalbumin with 5 percent of meat scrap. This experiment was conducted in lots of 6–9 Single-Comb White Leghorn chicks of both sexes, with 0, 5, 10, 15, and 20 percent of lactalbumin and 20, 15, 10, 5, and 0 percent of meat scrap, respectively.

The second experiment was conducted similarly to the first with Barred Rock chicks with lactalbumin of a lower protein content. Sufficient amounts of lactalbumin and meat scrap were included in these rations to supply a total of 9 lb. of crude protein per 100 lb. of ration. The results were similar to those in the first experiment. Growth of both sexes was higher with lactalbumin as the sole protein concentrate than with meat scrap alone. Mutually supplementary action between lactalbumin and meat scrap was again evident.

In the third experiment, sexed Barred Rock chicks were used for comparing ratios of lactalbumin protein to meet scrap protein from 65:35 to 100:0. The highest growth was promoted by lactalbumin protein to meet scrap protein at ratios of 80:20 and 90:10, emphasizing the curvilinear relationship in females. The highest rate of growth to 8 weeks of age was produced with a ratio of 75:25 on lactalbumin to meat scrap proteins.

The fourth experiment was similarly conducted with a total of 18 percent protein in the ration, again using Barred Rock chicks. Lactalbumin promoted a higher and more efficient growth rate of both sexes than did meat scrap. The high mutually supplementary action was produced when lactalbumin supplied 62.5 to 75 percent of the animal protein. Highest growth of males occurred with a ratio of lactalbumin to meat scrap protein of 75:25, but a ratio of 62.5:37.5 promoted maximum growth in females.

The fifth experiment involved different combinations of lactalbumin and soybean oil meal for Barred Rock chicks. Here the two sexes behaved differently as males increased in growth with increasing proportions of lactalbumin, but in females growth appeared to decrease with greater amounts of lactalbumin.

In the sixth experiment, body weights of both sexes were greatest with the larger amounts of lactalbumin with soybean meal, thus not supporting a mutually supplementary action between the two proteins. In the tests with lactalbumin and meat scrap, 2.4 percent of the chicks were affected with perosis, whereas in the tests of lactalbumin and soybean meal 3.3 percent of the chicks developed perosis.

In these studies there were used 75 Single-Comb White Leghorn and 514 Barred Rock chicks, on which growth was ascertained to 8 weeks of age.

Beef blood proteins in chick diets, C. R. GRAU and H. J. ALMQUIST. (Univ. Calif.). (*Poultry Sci., 23 (1944), No. 6, pp. 486–490*).—When blood proteins were used separately as protein supplements to a ration of wheat bran, wheat, corn, alfalfa, brewers' yeast, crude soybean oil, fish oil, and minerals, the serum and fibrin fractions were far superior to the blood-cell fraction (E. S. R., 90, p. 88). Autoclaving the blood cells did not improve them, nor was the growth bettered by additions of arginine, cystine, threonine, methionine, or tryptophan when fed alone or in combination, but the cell fraction supported growth when supplemented by pure isoleucine, which seemed to be an essential amino acid for the chick and a necessary addition to the blood-cell fraction. Satisfactory growth was produced with 15 or 20 percent protein rations of mixtures of blood-cell protein and corn gluten meal 1 : 2. Gains nearly equal to those with sardine meal were produced when this mixture of corn gluten meal and blood cells furnished 60 percent of the total protein present in the 15 or 20 percent protein rations. Increased growth rate was produced with isoleucine, but not with leucine. Approximate maximum supplementation occurred with 2 parts of blood-cell protein to 4 parts of corn-gluten-meal protein. The studies were conducted in 5 experiments with tests of 15 or 20 days' duration and a total of 20 lots of 4, 5, 10, or 12 chicks each.

The influence of storage on the supplementary protein nutritive value of certain fish meals, R. J. EVANS, J. S. CARVER, and W. S. HAMM. (Wash. Expt. Sta. et al.). (*Poultry Sci., 23 (1944), No. 6, pp. 491–494*).—As fish meals, demonstrated by Robertson, Carver, and Cook (E. S. R., 84, p. 381) as the most efficient protein concentrate for growing chicks, are largely seasonal and therefore must be stored, study was reported on the effect of wet and dry processes and additions of formaldehyde, sulfuric acid, and oat flour antioxidant on the nutritive value of dogfish meal in relation to storage and meal prepared at different times and commercial pilchard meal. The supplementary nutritive values determined by a modification of the gross value method of Heiman, Carver, and Cook (E. S. R., 82, p. 377) with 15 depleted chicks per lot showed no losses in the supplementary values of 16 fish-meal samples after 10 months' storage, although some had high fat contents. Additions of 0.5 percent formaldehyde and 0.25 percent H_2SO_4 had no effect on the nutritive value of wet-process meal. Dry-process dogfish meal had a lower nutritive value than wet-process meal. Results were not affected by storage in cotton, paper, or burlap bags.

Plant protein concentrates in the chick ration, C. I. DRAPER and R. J. EVANS. (Wash. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 507–509*).—Plant protein concentrates, including soybean meal, Alaska pea meal, and cottonseed meal and combinations of them, were fed to 1,100 day-old Single-Comb White Leghorn chicks in lots of 15 after depletion for 14 days by methods of Heiman, Carver, and Cook (E. S. R., 82, p. 377). Soybean meal had a higher gross value than cottonseed meal or any combination of soybean meal and cottonseed meal. Solvent-process soybean meal had a higher nutritive value than expeller-process meal. The gross value of soybean meal and ground feathers was below that of soybean meal alone.

Dried cow manure and dried rumen contents as a partial substitute for alfalfa leaf meal, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6, pp. 471–476*).—In a series of 3 experiments, 1,680 Rhode Island Red chicks were distributed in 48 pens for study of weights at 6–10 weeks of age on a basal ration of ground soybean meal, B-Y feed, and alfalfa leaf meal, or substitutes for the alfalfa which included cow manure dried at different temperatures from 21° to 160° C., rumen contents dried at 47°, or several mixtures of feedstuffs. Results were not particularly satisfactory except when cow manure or dried rumen contents were employed with supplements of vitamin A and riboflavin. The very slow drying of cow manure at 21° or by drying at 80° or above decreased the content of riboflavin and the androgenic effects. Sardine meal supported growth on a wartime ration practically as well and feed utilization was as good as when cow manure or dried rumen contents were used as substitutes for alfalfa leaf meal. However, sardine meal did not supplement cow manure. At 6 weeks of age the chicks weighed nearly 400 gm. with dried cow manure as the single supplement, alfalfa meal and fish meal, and dried cow manure and fish meal, but less than 300 gm. with sardine meal as the single supplement.

Corn-and-cob meal for growth of pullets and egg production, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul. 231 (1944), pp. 268–269*).—A preliminary report.

Relation of vitamin D to keel bone deformity in young chickens, S. R. JOHNSON and R. M. SMITH. (Ark. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 510–515*).—Data on the vitamin D necessary for normal keel bone development in chicks from 3 to 5 weeks of age on rations low in vitamin D showed that this vitamin had a uniform and highly significant effect on bone ash. The extent of crookedness of the keels was fairly closely related to bone ash deposition in individual trials. In other trials the crookedness was not serious regardless of the intake of vitamin D. In all trials the extent of crookedness of keels was significantly reduced by adding vitamin D to the ration. The studies were conducted in 7 trials for about 30 days each, with groups of 12–88 chicks in lots receiving 0, 25, 50, 100, and 150 or intervening units of vitamin D from 2 fish-liver oils or Delsterol were added per 100 gm. of the feed. The weights, mean percentage of tibia ash, and keel scores by methods of Hammond et al. (E. S. R., 87, p. 262) were ascertained. Supplementation of a ration extremely low in vitamin D reduced the extent of keel bone deformity, but the exact amount of vitamin D necessary to prevent the deformity was not ascertained because of the influence of other factors such as the genetic make-up, environment, growth rate, mineral content of the rations, and other influencing organic factors which may play a part in keel bone deformity.

Studies on the role of vitamin E in chick nutrition, H. PATRICK and C. L. MORGAN. (S. C. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6. pp. 525–528*).—In further study of the vitamin A and vitamin E relationship (E. S. R., 90, p. 386), it was shown that vitamin E was essential for utilization of vitamin A and carotene in a simplified ration, mostly of dextrin and casein with lard, gelatin, cellophane, and minerals. The weights of the chicks at 4 weeks of age and vitamin A contents of the livers showed that when the rations were supplemented with vitamin A or carotene, with or without α-tocopherol and exposed to indirect sunlight at room temperature for 12 days, there was only a small gain in weight and a trace of vitamin A in the liver. The gains in weight and amounts of vitamin A stored were increased when soybean phosphatide was added to the ration. When α-tocopherol and vitamin A were fed with freshly mixed rations, the weights of the chicks were improved and the vitamin A content of the livers showed a little improvement, but there was considerable improvement, at least in the vitamin A stored, when soybean phosphatides were included. After 6 months' storage (in paper bags) of the commercial ration supplemented with vitamin A and carotene, considerable vitamin A deficiency was noted. Encephalomalacia was frequent when the rations were stored, but when supplied with 100 or 500 International Units of vitamin A or 200 or 500 µg. of carotene per 100 gm. of the ration before feeding, no deficiency was apparent. The vitamin A and carotene appeared to be destroyed more by surface oxidation than by rancidity. Day-old unsexed White Leghorn chicks were used throughout the study.

Is the type of wheat fed a factor in "new wheat disease"? J. B. O'NEIL and W. J. RAE (*Poultry Sci., 23 (1944), No. 6, pp. 548–549*).—Marquis, Apex and Reward varieties of hard red spring wheat did not produce the pullet disease described by Quigley (E. S. R., 92, p. 255). Three groups of 25 Barred Plymouth Rock cockerels were fed for 28 days on rations which included 50–55 percent wheat, some of which was newly threshed. The gains were, however, considerably less where the ration consisted only of whole wheat from a new wheat crop.

Germination differences of wheat utilized in a study of pullet disease, G. D. QUIGLEY. (Md. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 547–548*).—In study of the relation of pullet disease to germination of wheat, the negative groups, so far as disease was concerned, showed high germination, averaging 89.4 percent, whereas those that were positive averaged 68.3 percent germination.

A chronic congenital ataxia in chicks due to manganese deficiency in the maternal diet, C. D. CASKEY, L. C. NORRIS, and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci., 23 (1944), No. 6, pp. 516–520, illus. 4*).—A tetanic spasm of the opisthotonic type, but occasionally spasms of the emprosthotonic or pleurothotonic types, occurred in chickens hatched from hens on a manganese-deficient ration. Histological examination of the brains of the ataxic chicks revealed no evidence of injury. As the chicks became older the ataxia was less evident. Progeny of ataxic parents were not ataxic and developed normally during the first 8 weeks after hatching, indicating the lack of hereditary effects on the condition. Ataxia was observed almost entirely in chicks hatched from eggs of hens receiving a balanced ration containing 6.3 µg. of manganese per gram. With the exception of one chick, no hens on rations with 35 µg. of manganese per gram which had normal hatchability produced chicks with ataxia.

A device for testing the breaking strength of shell eggs, D. C. KENNARD (*Ohio Sta. Bimo, Bul. 231 (1944), pp. 270–273, illus. 4*).—This device was designed for testing eggshell shock by rolling the eggs in a carriage down a slide. A suitable calcium supplement seemed necessary in the ration to give a satisfactory shell strength. Hot weather and magnesium limestone tended to weaken the shells.

Comparative quality losses in eggs stored in fibre and wooden cases, W. KOHLMEYER and C. S. SHAFFNER. (Ind. Expt. Sta.). (*U. S. Egg and Poultry Mag., 50 (1944), No. 7, pp. 295–297, 336*).—Data were recorded on weight loss, candling grade, albumen index, and palatability. After 2, 4, and 6 months' storage the eggs in 30 fiber cases of 10 different types were not consistently different from those stored in 6 new standard wooden cases.

The pasteurization of liquid whole egg, P. A. GRECO (*Iowa State Col. Jour. Sci., 19 (1944), No. 1, pp. 13–19*).—The effect of heat between 56° and 68° C. on the denaturation of whole eggs indicated that the rate of denaturation was 250 times more rapid at 68° than at 56°. Over 99 percent of the culture of *Escherichia coli* was destroyed at 56°, 59°, 62.5°, and 66°; this culture at 62.5° required less than 1 min., whereas another culture required 6 min. for an equal amount of destruction. The age of the eggs had a definite effect on the thermal resistance of the bacteria suspended in the melange. Bacteria were more easily destroyed in melange having a pH of 7.4–7.6 than with a pH of 6.4–6.8, probably accounting for the differences in fresh and aged eggs. *E. coli* was more easily destroyed in egg melange than in milk. The time necessary for destruction of 99 percent of the cells was 7 min. in egg melange and 17.5 min. in milk, largely due to differences in pH. In flash pasteurization studies, egg melange could be effectively pasteurized by heating for 32.5 sec. at 67°. The few surviving organisms were of types commonly found in milk. Probably other types of milk pasteurization equipment could be utilized if there were sufficiently sensitive controls of temperature.

A study of the body type and market finish of the Broad-Breasted Small-type White turkey, M. I. DARROW and C. L. MORGAN. (S. C. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 6, pp. 467–470*).—Study was made of the size, body conformation, and market finish of 851 live Small-type White turkeys at 24 weeks of age, grown under both range and confinement conditions. Weights were recorded and market quality was ascertained in four grades based on fat covering and degree of feathering for males and females. Measurements were compared for those of 6 standard varieties of turkeys reported by R. G. Jaap, T. T. Milby, and R. B. Thompson.[1] The shank length of this variety averaged 0.2 to 0.9 in. shorter for males and 0.3 in. shorter for females than other varieties. The Small-type White turkey has sufficient fleshing at 24 weeks of age, but is lacking in feathering quality.

Lack of water a cause of loose, slimy gizzard linings accompanying early mortality in poults, J. C. HAMMOND. (U. S. D. A.). (*Poultry Sci., 23 (1944), No. 6, pp. 477–480*).—It was concluded, from the results of one experiment with 4 lots of 20 turkey poults each, that lack of water was a primary cause of this condition when associated with early nonspecific mortality. One lot received no feed or water. Other lots had water but no feed, feed but no water, or water and feed. Autopsies of these birds were made at 1 week of age. In another experiment there were 4 lots of 25 poults each, of which one lot received supplements of corn oil with vitamins A and D and 3 other lots received fortified cod-liver oil at 0.5- and 3-percent levels (with corn oil included in one of them). In another experiment 4 lots of 25 poults were given no feed for 24, 48, 72, and 96 hr. after hatching. The turkeys from which feed was withheld 72 hr. showed little interest in eating, but they were force-fed. Gizzard erosion was ascertained at autopsies after 2 weeks.

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[1] Oklahoma Sta. Mimeog. Cir. 49 (1939), pp. 9.

DAIRY FARMING—DAIRYING

Milk goats in Tennessee, S. A. Hinton and J. J. Bird (*Tennessee Sta. Bul. 193 (1944), pp. 13, illus. 9*).—A general account of the principles of milk-goat production, including diseases found in the State, with descriptions of the breeds and cost of production data.

The milk goat in Canada, J. A. Telfer (*Canada Dept. Agr. Farmers' Bul. 125 (1944), pp. 18, illus. 10*).—General directions for milk goat production, with descriptions of the Toggenburg, Saanen, and Anglo-Nubian breeds.

Physiological factors in lactation relating to milking and mastitis, W. E. Petersen. (Univ. Minn.). (*Cornell Vet., 34 (1944), No. 1, pp. 38–51*).—A general discussion of the development of the mammary gland, lactation, and suggestions for proper milking and the use of the milking machine.

Mastitis and the plate count of milk, III, IV, H. W. Seeley, Jr., E. O. Anderson, and W. N. Plastridge. ([Conn.] Storrs Expt. Sta.). (*Jour. Milk Technol., 7 (1944), No. 4, pp. 191–199*).—These two studies continue this series (E. S. R., 87, p. 847):

III. *A quantitative study of the growth of Streptococcus uberis in various plating media* (pp. 191–194).—Data are reported on the plating in parallel in standard agar, ox-blood agar, and Edwards' crystal violet esculin ox-blood agar. Standard agar and Edwards' medium supported growth of *S. uberis* equally well, but the blood agar supported the growth of about 18 percent more organisms. Colonies grown in standard medium averaged about 37 percent more surface growth than those grown in blood medium. Although blood agar yielded greater numbers of colonies, it did not permit differentiation of *S. uberis* colonies from those of other bacteria found in the mixed flora of milk. Edwards' agar was equal to standard agar in the support of growth of *S. uberis* and permits preliminary identification.

IV. *The contribution of Streptococcus uberis mastitis to the plate count of herd milk* (pp. 195–199).—Partially differential plate counts of samples of milk from 23 udder quarters harboring *S. uberis* showed a geometric mean of 3,000 per cubic centimeter. In this experiment the *S. uberis* counts were not great enough to influence the plate count of high-count milk, but in smaller herds infected animals might materially increase the plate count.

Salt migration in Cheddar cheese curd and its effect on moisture content, pH, and bacterial content, W. H. Hoecker and B. W. Hammer. (Iowa Expt. Sta.). (*Food Res., 9 (1944), No. 4, pp. 278–288, illus. 2*).—Moisture and salt determinations were made on micro-samples from the surfaces and centers of pieces of curd at intervals during the first 72 hr. after hooping. Variations in the bacterial action and pH of the surfaces and centers of the pieces were also ascertained. The cheese was made from pasteurized milk. Approximately 2.5 percent granular salt was added to the milled curd at three intervals of about 15 min. each. The curd was rinsed about 1 hr. after the first addition of salt and placed in hoops and pressed for 48 hr., after which the cheeses were removed and held at 50° F. The moisture contents varied from 39.2 to 40.6 percent, and the salt content from 1.97 to 2.04 percent in 10 samples analyzed by micro-procedures. The moisture contents decreased rather rapidly at both the surface and centers during the first 15 hr. of pressing, with the greatest loss occurring at the surface during the first 5 hr. Salt content at the surface of pieces of curd was relatively high at hooping, but at the centers salt content was low. During pressing there were rapid decreases in the salt content at the surface. There were usually small differences in the salt content of centers and surfaces. Although differences in the pH of the centers and surfaces of curd samples fluctuated somewhat, differences were small 24 hr. after removal from the press. The salt and moisture distribution were fairly uniform after 4 months' ripening. Although bacterial counts were variable, the numbers of bacteria at the centers and surfaces were essentially the same.

Powdered whole milk and milk products—their possible effect upon the future of the dairy industry, P. H. TRACY. (Univ. Ill.). (*Jour. Milk Technol., 7 (1944), No. 4, pp. 206–210*).

VETERINARY MEDICINE

[Contributions on veterinary medicine] (*U. S. Livestock Sanit. Assoc. Rpt., 47 (1943), pp. 31–41, 47–76, 79–92, 94–97, 104–105, 122–183, 186–200, 202–233, 239–253, illus. 5*).—Among the contributions presented at the annual meeting held December 2–4, 1943 (E. S. R., 89, p. 724), are the following: Cooperative Bovine Brucellosis Work in the United States, by A. E. Wight (pp. 31–34) (U. S. D. A.); Thoughts on the Control of Brucellosis in Cattle, by R. R. Birch (pp. 35–41) (Cornell Univ.); History and Result of Calfhood Vaccination in the Dunloggin Herd, by M. M. Rabstein (pp. 47–51) (U. S. D. A.); Brucellosis in Swine, by L. M. Hutchings (pp. 52–58) (Ind. Expt. Sta. coop. U. S. D. A); Twelve Years of Vesicular Exanthema, by C. U. Duckworth and B. B. White (pp. 79–84); Vesicular Stomatitis in Swine, by H. W. Schoening (pp. 85–86) (U. S. D. A.); Pig Mortality, by H. C. H. Kernkamp (pp. 87–89) (Minn. Sta.); Army Inspection of Meat and Milk, by J. E. Noonan (pp. 94–97); Progress and Value of Federal Poultry Inspection in Wartime, by H. A. Weckler (pp. 104–105); A Review of the Literature on Newcastle Disease, by F. R. Beaudette (pp. 122–177) (N. J. Stas.), which includes 77 titles; A Method of Testing Coccidiosis Remedies for Poultry, by G. C. Roe and J. H. Collins (pp. 178–183); The Present Status of Canine Rabies Vaccination, by H. N. Johnson (pp. 190–195); Panel Discussion on Diseases of Cattle (pp. 202–233); The Importance of Continuing Activities in Tuberculosis Eradication in Livestock, by A. E. Wight (pp. 239–241) (U. S. D. A.); Progress in the Eradication of Tuberculosis in Poultry and Swine, by H. R. Smith (pp. 242–247); and The Eradication of Bovine Tuberculosis and Its Effect on the Human Tuberculosis Control Program in Michigan, by G. A. Sherman (pp. 248–251).

Committee reports, among them those on brucellosis, by C. R. Donham et al. (pp. 59–63); parasitic diseases, by J. E. Ackert et al. (pp. 64–73); miscellaneous transmissible diseases, by A. Eichhorn et al. (pp. 74–76); transmissible diseases of swine, by F. L. Carr et al. (pp. 90–92); poultry, by H. J. Stafseth et al. (pp. 186–189); rabies, by H. W. Schoening et al. (pp. 196–200); and tuberculosis, by E. T. Faulder (pp. 252–253).

[Miscellaneous contributions on veterinary research] (*Vet. Med., 39 (1944), No. 12, pp. 451–455, 461–462, illus. 6*).—Articles noted in this issue include the following: Veterinary Reports on the Use of Sulfanilamide Against Anthrax in Cattle and Horses, by R. B. Wilcox (pp. 451–452); Lead Arsenate an Effective Taeniacide for Domestic Ruminants, by R. D. Radeleff (pp. 453–454); Comparison of the Agglutinability of Several *Brucella* Antigens (Rapid Test), by G. R. Bennett (p. 455) (Mich. Expt. Sta.); The Use of Sulfapyridine in the Treatment of Chronic Necrotic Rhinitis ("Bull-Nose"), by E. Adams (p. 461); and Nuttall Death Camas Poisoning in Horses, by M. D. Morris (p. 462).

[Observations on animal diseases] (*Vet. Jour., 100 (1944), No. 9, pp. 176–187, 187–191*).—These articles include Observations on Equine Colic, by J. W. Rainey (pp. 176–182); A Study of 97 Consecutive Cases of Bovine Dystocia as They Were Encountered in the Course of General Practice, II,[1] by J. B. Tutt (pp.

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[1] Vet. Jour., 100 (1944), No. 8, pp. 154-161.

182–187); and Pasteurellosis in Poultry and Wild Birds in Tanganyika Territory, by F. G. Waddington (pp. 187–191).

[Contributions on veterinary medicine] (*Jour. So. African Vet. Med. Assoc., 15 (1944), No. 1, pp. 1–16, illus. 4*).—This number includes the following: Biliary Fever of Dogs in East Griqualand, by C. W. A. Belonje (pp. 1–3); Sarcosporidiosis in Sheep, and Its Relation to Certain Forms of Myositis, by A. D. Thomas (pp. 4–5); Eosinophilia in a Dog (Case Report), by B. S. Parkin (pp. 6–7); Foreign Bodies in the Reticulum of a Cow (Case Report), by V. R. Kaschula (pp. 8–9); Psittacosis in a Budgerigar (*Melopsittacus undulatus*), by J. D. W. A. Coles (pp. 10–12); A Simple Method of Obtaining Large Amounts of Sterile Blood From Fowls, by D. A. Haig and J. D. W. A. Coles (pp. 13–15); and Giemsa Staining of Large Numbers of Smears, by M. C. Lambrechts (p. 16).

Diagnostic methods in veterinary medicine, G. F. Boddie (*Edinburgh: Oliver & Boyd, 1944, pp. 328+, illus. 31*).—The object of this work is to present a description of the diagnostic methods used in veterinary medicine and details of their interpretation. A chapter on clinical hematology, by H. H. Holman, is included.

Some clinical diagnostic methods of use in conditions associated with animal parasites, M. L. Bingham (*Vet. Rec., 56 (1944), No. 35, pp. 313–316*).—This describes mainly technics used at the Research Institute in Animal Pathology at Streatley, Berks, England.

Vitamins of the B complex in surgical practice, J. L. Davidson (*Vet. Med., 40 (1945), No. 1, pp. 16–18, illus. 1*).—The author feels that the use of vitamins of the B complex in surgical practice in veterinary medicine is of great importance and will in certain cases decide the difference between recovery and death. "This therapy is especially indicated in all forms of septic surgery and in those cases which require a preparatory glucose infusion. In those cases in which bleeding may be extensive or prolonged, it is felt, in view of work which has been done, that the parenteral administration of thiamine hydrochloride in therapeutic doses is definitely indicated."

Studies on the vitamin requirement of tapeworms, C. J. Addis and A. C. Chandler (*Jour. Parasitol., 30 (1944), No. 4, pp. 229–236*).—To test the effects of the presence or absence of various vitamins and vitamin combinations on the establishment and growth of *Hymenolepis diminuta,* groups of six female albino rats were infected with 10 cysticercoids each and autopsies made on the fourteenth day. The average number of worms per rat was reduced by a diet deficient in either the fat-soluble vitamins or the G complex and was reduced still further when both of these vitamins were missing. It is suggested that the effect of the lack of the fat-soluble vitamins may be due to some disturbance in the secretion of bile, thus preventing the proper evagination of the cysts. The absence of vitamin B_1 had very little, if any, effect upon the establishment of the worms.

The experiments corroborated previous evidence that the lack of some factor associated with the G complex in the diet of the host causes a marked stunting in the growth of the worms. This becomes more marked the longer the depletion period of the host prior to infection, suggesting that the necessary component is absorbed from the host's mucous membrane and is not obtained in adequate amount in a depleted host. The lack of vitamins A, D, and E or B_1 in the diet of the host causes an increase in size of the worms present. It is suggested that "this increase in size over that of the controls is the result of the partial paralysis of the intestine, brought about by the vitamin deficiency, thus enabling the worms to become established in a more favorable anterior position. Since the worms grow in a perfectly normal manner in the absence of any vitamin in the diet of the host except something associated with the G complex, even after a long depletion period which should reduce them in the tissues with which the worms are in contact, the possibility of synthesis of these vitamins by the worm is suggested."

Propamidine in wound sepsis, A. R. WITHERS and G. S. POWLEY (*Vet. Rec., 56 (1944), No. 34, p. 308*).—Successful results obtained with both large and small animals with an aromatic diamidine preparation are noted.

The chemoprophylactic and therapeutic action of a wide variety of chemical compounds on two neurotropic virus infections in mice, S. D. KRAMER, H. A. GEER, and D. A. SZOBEL (*Jour. Immunol., 49 (1944), No. 5, pp. 273–314*).—This report gives the results of 412 experiments testing the prophylactic and therapeutic value of 190 chemical compounds on poliomyelitis and St. Louis encephalitis infections in white Swiss mice. A list of 71 references is appended.

The combined bacteriostatic activity of sulfanilamide and azochloramid upon streptococci in in vitro and in vivo studies, F. M. SKELTON. (S. Dak. Expt. Sta.). (*Jour. Bact., 47 (1944), No. 3, pp. 273–275*).—The bacteriostatic activity of azochloramide and of sulfanilamide toward *Streptococcus agalactiae* (group B) was found to be greater when the two drugs are used in combination than when either is used alone in like or higher concentrations. However, the combined use of azochloramide and sulfanilamide in the treatment of infectious bovine mastitis appeared to give unsatisfactory results.

A powerful inhibitory substance produced by group N streptococci, A. T. R. MATTICK and A. HIRSCH (*Nature [London], 154 (1944), No. 3913, p. 551*).—Tests of an inhibitory substance produced by a streptococcus isolated from stored milk by Whitehead (E. S. R., 71, p. 151) revealed marked inhibitory properties in vitro toward many groups of pathogenic streptococci, some species of *Bacillus, Clostridium,* and lactobacilli. Concentration of this substance resulted in a product of high potency which completely inhibited the growth of *Streptococcus agalactiae* in a dilution of 1 : 640,000 and had marked therapeutic properties when given intravenously to a mouse following inoculation with a mouse-virulent hemolytic streptococcus. Additional tests with 20 control mice and 20 mice receiving about 10,000 lethal doses of the streptococcus also showed marked therapeutic results. Experiments in purification and application are being continued.

Preliminary clinical report on vivicillin, E. VON LUSTIG-LENDVA (*Vet. Rec., 56 (1944), No. 22, pp. 178–179*).—This is a preliminary report on the results achieved in clinical tests, mainly in small animals, with a standardized antibacterial pyrogen-free metabolite preparation containing living *Penicillium notatum* Fleming.

Studies on the toxicity of gold compounds in rats, C. W. DENKO and A. K. ANDERSON. (Pa. Expt. Sta.). (*Jour. Lab. and Clin. Med., 29 (1944), No. 11, pp. 1168–1176*).—The nonprotein nitrogen value of the blood has been used in determining the toxicities of several commercial and experimentally synthesized gold compounds. High blood nonprotein values were always found where tissue changes indicating kidney damage had occurred. In some cases high blood nonprotein nitrogen values occurred where there was no evidence of tissue change.

The respiration of the protozoan parasite, Eimeria tenella, B. F. SMITH and C. A. HERRICK. (Wis. Expt. Sta.). (*Jour. Parasitol., 30 (1944), No. 5, pp. 295–302*).—Studies on the metabolic rate of *E. tenella* and invaded tissues were carried on. Oocysts and tissues were supplied by Leghorn chickens weighing approximately 700 gm. if used for oocyst production or 300 gm. if used in studies of the respiration of the coccidia within the epithelial cells of the cecal pouches.

The oxygen consumption of tissue parasitized with *E. tenella* was significantly higher than that of normal tissue. The respiration of unsporulated oocysts was from 10 to 20 times greater than that of sporulated oocysts. The respiration of oocysts remained fairly constant within the pH range of 1.2 to 8.8.

Investigations on rickettsial diseases in Texas, III, IV (*Tex. Rpts. Biol. and Med., 1 (1943), No. 4, pp. 371–388, illus. 9; pp. 389–409, illus. 9*).

III. *Spotted fever: Protection of laboratory animals by intradermal inoculation of immune rabbit serum,* L. Anigstein, M. N. Bader, G. Young, and D. Neubauer.—From these studies with guinea pigs of the intradermal route for separate inoculation of spotted fever virus and immune serum, it is concluded that "due to a certain biological autonomy of the skin as an organ, it is possible to create a local immunity by introduction of a pathogenic agent (bacterial or viral), which phase is eventually followed by a general and solid immunity. In the present studies an interception of the virus has been attained in various degrees at the site of the original injection by employing varying minute amounts of specific serum."

IV. *Experimental study of Bullis fever,* L. Anigstein and M. N. Bader.—An infectious agent, not cultivable on ordinary bacteriological media, has been recovered from guinea pigs inoculated with ticks (*Amblyomma americanum*) collected from the military reservation area at Camp Bullis, Tex. The place of origin of the ticks has been for the last 2 yr. the scene of mass outbreaks of an apparently new clinical syndrome, called Bullis fever. The results of the present work demonstrate that *A. americanum* is the vector or at least one of the carriers of Bullis fever in nature.

Salmonella loma-linda: A new type isolated from meningitis, P. R. Edwards. (Ky. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 57 (1944), No. 1, pp. 104–106*).—A new *Salmonella* type, *S. loma-linda,* is described, represented by the antigenic formula IX, XII:*a-e, n, x* . . .

Host list of the genus Trichomonas (Protozoa: Flagellata).—II, Host-parasite list, B. B. Morgan. (Wis. Expt. Sta.). (*Wis. Acad. Sci., Arts, and Letters, Trans., 35 (1943), pp. 235–245*).—Supplementing part 1 (E. S. R., 89, p. 706), the species are given after the names of their respective hosts, these being listed by phyla, classes, orders, and families.

The adaptation of Mycobacterium paratuberculosis to artificial culture media prepared without the addition of the "essential substance," H. Konst (*Canad. Jour. Pub. Health, 35 (1944), No. 10, pp. 392–395*).—Although *M. paratuberculosis,* the causative agent of chronic paratuberculosis enteritis of cattle and sheep, is commonly distinguished from the tubercle bacillus in part by the fact that its isolation from the natural host has been considered possible only on culture media to which a growth factor has been added, seven freshly isolated strains were adapted to Long's synthetic medium prepared without the addition of the supposedly essential substance. This fact suggests that *M. paratuberculosis* may be adapted in a comparatively short time after its isolation from the natural host to suitable plain artificial media. Although some variability may occur in occasional strains due to the prolonged cultivation on such media, most strains retain their original gross cultural characteristics and are suitable for the production of a potent diagnostic agent.

Trials to increase the luxuriance of adapted strains of *M. paratuberculosis* by cultivation on Dorset's synthetic medium (E. S. R., 71, p. 98) at various pH levels were unsuccessful.

Development and survival under outdoor conditions of eggs and larvae of the common ruminant stomach worm, Haemonchus contortus, A. G. Dinaburg. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 69 (1944), No. 11, pp. 421–433*).—This is a quantitative study of the rates of development and survival of the various free-living stages of *H. contortus* under the influence of natural weather conditions at Beltsville, Md., from August 1939 to October 1940.

When eggs of *H. contortus* were exposed outdoors for 3 days or more to mean maximum temperatures below 65° F., few preinfective larvae—those recovered after 3 or 6 days' exposure— and no infective larvae—those recovered after 13 or more days—were found during the experiments, regardless of the amount of rainfall. With mean maximum temperatures between 66° and 84° during the first 3 days, the amount of rainfall in the week preceding and the 3 days following exposure of the eggs considerably affected the degree of their development. After 13 to 20 days outdoors, with no rainfall, infective larvae recovered, based on the number of controls, at no time exceeded an average of 0.01 percent; with 0.12 to 0.72 in. and 0.88 to 2.09 in. of rainfall, the highest averages were 0.5 and 21 percent, respectively. Higher percentages of preinfective larvae were recovered. With mean maximum temperatures between 86° and 93° and 0.26 to 1.57 in. of rainfall, the highest recovery of infective larvae was 8 percent, after 13 days. Exposure to full sunlight resulted in lower yields of larvae than exposure to full shade or partial shade. In the middle temperature range, recoveries from exposure to full and partial shade were about the same. In the upper temperature range recoveries from the former were consistently higher than from the latter.

It is concluded that "eggs do not survive exposure to mean maximum temperatures below 70° for more than 6 to 13 days, as shown by cultures, or for more than 13 to 20 days, as shown by salt flotations. Above 70°, salt flotations indicate that eggs do not survive more than 6 to 13 days outdoors.

"In designating large periods of the year as unfavorable for the survival and development of the eggs of *H. contortus,* temperature is a more reliable weather factor than rainfall."

Bionomics of the lymnaeid snail, Stagnicola bulimoides techella, the intermediate host of the liver fluke in southern Texas, O. W. OLSEN. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *69* (*1944*), *No. 10, pp. 389–403, illus. 4*).—Information on the bionomics of this snail was sought because of the importance of the liver fluke (*Fasciola hepatica* Linn.) as a parasite of cattle and sheep in the Gulf coast region of the United States. Slaughter records for 10 yr. under Federal meat inspection, obtained from six Gulf coast packing houses in Texas, Louisiana, and Florida, showed 37.5 percent of the native adult cattle and 6 percent of the calves to be infected with the liver fluke. Field investigations were made in 1940 and 1941 in the Gulf coast prairie region of Texas, and laboratory studies were carried on simultaneously.

The study showed that the snails live in the temporary and semipermanent pools that are scattered over the entire area. The pools are generally only slightly alkaline in reaction and have extensive soil-water peripheries where the snails live. The life cycle of *S. bulimoides techella* follows a rather well-defined pattern with two generations annually. One generation occurs in midwinter and the other late in the spring. When the habitats become dry in the spring or early in the summer, the young snails estivate in the soil until the fall rains. Development of the snails is rapid under favorable conditions, being as short as 20 days from egg to egg. The adult snails usually die when about 6 mo. old, after the period of reproduction. Under laboratory conditions, the snails were found to remain alive as long as 25.5 mo., during which time standing water was present in the aquarium for 2 to 7 days only at the beginning of each month. The snails are capable of withstanding periods of desiccation as long as 5 mo. under field conditions when estivating in the soil or when exposed in an open dish in the laboratory. The lethal effect of drought on the snails when the pools become dry is immediate rather than cumulative.

Egg production of individual snails is high. They have been found to produce as many as 6,479 eggs during a life span of 5 mo. and a laying period of 129 days. The snails surviving the summer drought are predominantly juveniles; they emerge from estivation when the fall rains restore the pools, develop rapidly, and oviposit. The snails do not migrate, but they may be distributed widely by water during periods of heavy rainfall when the country is inundated. The mean infection with liver fluke of 16,276 snails dissected during 1 yr. was 0.0051 percent. In one temporary pool the rate of infection in the latter part of November was 6.6 percent. Natural infection was found to occur throughout the year.

Brucellosis: An outline of the disease in man and animals, W. S. STONE (*N. Y. State Vet. Col. Rpt., 1942–43, pp. 95–107, illus. 4*).

The effect of Brucella abortus strain 19 on cattle of various ages and its bearing on adult cattle vaccination, C. M. HARING and J. TRAUM. (Univ. Calif.). (*U. S. Livestock Sanit. Assoc. Rpt., 47 (1943), pp. 42–46, illus. 1*).—Observations on the incidence of brucellosis as influenced by the use of strain 19 in cattle of various ages under controlled experimental conditions as well as in commercial dairy herds are reported. The resistance produced by the vaccination was apparently greater in animals adolescent or mature at vaccination than in calves vaccinated when younger than 9 mo. After the infection had become established, there was very little difference between the calf crop of the group vaccinated as adults and that vaccinated as calves. Abortion in rare instances followed the injection of strain 19 with pregnant cows after the fourth month of lactation, and some loss of milk production has resulted in lactating cows. Nevertheless, it is concluded that strain 19 "is the only product at present that has been used on thousands of animals with any degree of satisfaction."

Adult vaccination against brucellosis in cattle, W. V. LAMBERT ET AL. (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 811, pp. 190–193*).—This report, published with the approval of the committee on animal health of the National Research Council, points out that the ultimate goal of the livestock industry should be the elimination of brucellosis from the animal population, and indicates that "the intelligent use of strain 19 vaccine should contribute materially to this end." Recommendations for procedure are offered, and the need for additional research is emphasized.

Clinical aspects of "grass staggers"—milk fever syndrome, A. A. BLAKELY (*Vet. Rec., 56 (1944), No. 22, pp. 175–176*).—Three classes of this disease of cattle in New Zealand are described, (1) identified with grass tetany, (2) a complicated "milk fever," and (3) an acetonemia of nervous type, superimposed upon a low blood Mg level.

Bovine leptospirosis, E. JUNGHERR. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 812, pp. 276–281, illus. 8*).—The present report deals with the pathologic investigation of three fatal "mysterious" deaths in adult cows in Connecticut during 1943–44. In one of them, illness developed at the height of milk production, and was characterized by anorexia, subnormal temperature, and terminal convulsion on the sixth day. The only gross lesion was so-called nutmeg appearance of the liver which corresponded microscopically to multiple areas of sinusoidal congestion and hemorrhage associated with extensive parenchymatous necrobiosis. Levaditi preparations showed numerous *Leptospira*-like bodies in the liver and few in the kidneys. The spleen showed extensive hemosiderosis.

Two cows died on another farm in 1 week, the loss occurring within 2 days after normal calving. Symptoms consisted of milk preparturient fever, anorexia, and bloody milk. Gross pathology was characterized by edema and hemorrhage in the udder, numerous petechiae and ecchymoses in the subcutis and subserosae, and abnormal striation of the renal cut surface. Microscopically, one case showed large foci of tubular karyolytic necrosis in the kidneys, associated with large nests of *Leptospira* organisms in silver impregnated sections. The other case showed, primarily, foci of tubular hypertrophy in the kidneys and nests of *Leptospira* in an adjacent mesenteric lymph node.

records showed that the single determination would have led to a correct interpretation in 95 percent of the cases.

Vitamin synthesis by torula yeast, J. C. LEWIS, J. J. STUBBS, and W. M. NOBLE. (U. S. D. A.). (*Arch. Biochem., 4 (1944), No. 3, pp. 389–401*).—*Torulopsis utilis* propagated under aeration in a fruit juice medium produced a tenfold yield in terms of the inoculum in a 6–8-hr. period. Vitamin balance experiments in which vitamin assays were made on inocula and fruit juices, as well as the crop yeast and spent liquors, indicated synthesis of the B vitamins by the yeast. Although the amount synthesized varied in the different fermentation runs, the averages in micrograms per gram of dry yeast produced amounted to 22, 71, 530, 241, 1.23, 35, and 56 for thiamine, riboflavin, nicotinic acid, pantothenic acid, biotin, pyridoxin, and *p*–aminobenzoic acid, respectively. In some cases there was appreciable absorption of the vitamins originally present in the medium, while in others there was excretion of the vitamin from the yeast into the medium. Although the vitamin content of the yeast was roughly comparable to that of bakers' and brewers' yeast, the high yields of *T. utilis* obtainable from cheap substrates make it an outstanding vitamin producer.

B vitamins in germinating seeds, V. H. CHELDELIN and R. L. LANE (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 53–55*).—Samples of black-eyed peas, lima beans, and cottonseeds were assayed before and after germination for their content of the various B vitamins. The values, reported on the basis of total solids, indicated that germination of the seeds was accompanied by increases in the content of most B vitamins. The increases were greatest for nicotinic acid, followed by pyridoxine, pantothenic acid, riboflavin, inositol, and biotin. Thiamine was a border-line case. Folic acid increased in peas and in one sample of lima beans. Corn and bush lima beans analyzed at different stages of growth were found to reach a peak in B-vitamin values at a relatively early stage of development, after which they decreased in vitamin value as the seeds matured.

Biotin.—Annotated bibliography, 1944 (*Rahway, N. J.: Merck & Co., 1944, rev., pp. 104+*).—In this annotated bibliography, the literature on biotin is summarized under the headings chemical investigation and description, occurrence, physiological activity, clinical uses, method of assay, and reviews.

Utilization of biotin and biotin methyl ester by Lactobacillus casei, J. L. STOKES and M. GUNNESS (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 28–31, illus. 1*).—Three different strains of *L. casei* were utilized in tests employing the general procedure and medium of Landy and Dicken (E. S. R., 90, p. 298) in the assay method for biotin. The crystalline biotin or biotin methyl ester in fresh solution was added to the medium which, after sterilization by autoclaving, was inoculated with the organism whose response was followed by estimating the amount of acid formed. Essentially maximum acid formation occurred with two different preparations of the methyl ester of biotin as well as with biotin, indicating that both of these substances could be used by *L. casei*. With the ester, however, growth and fermentation were slower than with free biotin.

Investigations on the food value of fish and other marine products, I, II (*Indian Jour. Med. Res., 30 (1942), No. 2, pp. 315–318; 31 (1943), No. 1, pp. 25–27*).

I. *The antipellagra vitamin (nicotinic acid)*, M. L. Khorana, M. L. Sarma, and K. V. Giri.—Nicotinic acid was determined in the muscle tissue of 17 fish, and in prawns, crabs, and cuttle fish, all obtained from the coastal waters of Waltair; these were economically important foods in the northern Circars, and the specimens are designated for the most part by common English, local, and zoological names. Nicotinic acid was determined in muscle extracts obtained by alkaline hydrolysis of the finely minced tissue. The nicotinic acid in the neutralized extract was adsorbed on medicinal charcoal and eluted with an alcohol-NaOH mixture. The eluate was adjusted to pH 5.6, treated with acetate buffer, and then with the reagents cyanogen bromide and *p*-aminoacetophenone; the color developed was measured colorimetrically against a standard similarly treated. The nicotinic acid content of these fish-muscle tissues ranged from 0.63 to 4.8 mg. per 100 gm. of fresh tissue.

II. *The protein and mineral contents,* M. L. Khorana, M. L. Sarma, P. Seshagiri Rao, and K. V. Giri.—Protein, Ca, P, Fe, and Cu were determined, by methods noted, in the muscle tissue of 12 of the food fishes. The protein content ranged from 18 to 23 percent, Ca from 0.006 to 0.090, and P from 0.150 to 0.356 percent; Fe from 0.6 to 2.5, and Cu from 0.01 to 0.24 mg. percent.

Nicotinic acid in products of commercial rice milling and in rice varieties, M. C. Kik and F. B. Van Landingham. (Ark. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 2, pp. 154–158*).—Data for nicotinic acid as determined by the method of Melnick (E. S. R., 89, p. 11) are reported for samples previously analyzed for thiamine and riboflavin (E. S. R., 91, p. 488). The average nicotinic acid content of paddy or rough rice was 49.2 µg. per gram and of the whole brown rice 55.1 µg. per gram.

"Of the finished, clean products, the end product, head rice (sold for human consumption), contained an average of 18.4 µg. and second head 17.7 µg. per gram of dry matter. An average of 66.4 percent of nicotinic acid was removed during the milling process. Screenings and brewers' rice contained 23.8 and 36.1 µg. nicotinic acid, respectively. Of the byproducts, hulls contained 18.6 µg. per gram, bran from 262.8 to 358.2 µg. per gram, and rice polish 206.6 to 408.0 µg. per gram of nicotinic acid. Three samples of milled parboiled rice (prepared in three different localities) contained 49.0, 45.2, and 45.0 µg. of nicotinic acid per gram of dry material. Two samples of undermilled rice contained 26.2 and 26.6 µg., compared with 19.5 and 18.9 µg. per gram in the milled rice. The average nicotinic acid content of all varieties (rough rice) was 46.5 µg. per gram. The nicotinic acid content of rice differed with variety and to a small extent with locality."

The effect of calcium pantothenate and paraaminobenzoic acid on gray hair in man: A study on a group of young and older individuals, H. Brandaleone, E. Main, and J. M. Steele (*Amer. Jour. Med. Sci., 208 (1944), No. 3, pp. 315–321*).—Confusing reports on the effect of calcium pantothenate and *p*-aminobenzoic acid on gray hairs in man or animals are reviewed. Several series of tests on humans are reported, with the finding that out of 33 gray haired subjects treated with calcium pantothenate and *p*-aminobenzoic acid alone or combined and with and without brewers' yeast only 2 showed significant changes in the color of the hair during the treatment, which consisted in their case of 100 mg. of calcium pantothenate, 200 mg. of *p*-aminobenzoic acid, and 50 gm. of brewers' yeast daily. These 2 subjects were in a group of 19 individuals over 55 yr. of age. In a group of 8 younger individuals, 6 of whom received for 6 mo. the same treatment as noted and 2 the same without the brewers' yeast, and in another group of 6 younger individuals who received 20 mg. of calcium pantothenate and 3.5 gm. of concentrate yeast daily, there was no return of the previous color of the hair. A common occurrence was the appearance of a yellowish or greenish cast to the gray hair, usually appearing during the first few months and not always persisting. Another frequent appearance was new growth of scattered wiry black hairs.

Effect of alanine on response of Lactobacillus casei to pyridoxine and folic acid, E. E. Snell (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 36–39*).—The technic previously employed (E. S. R., 88, p. 712) was used with the medium modified to be almost identical with that of Landy and Dicken (E. S. R., 90, p. 298). Various vitamins were omitted in turn from this medium, and the quantitative growth response to additions of the vitamin was determined in the presence and absence of *dl*-alanine at a level of 2 mg./10 cc. The presence of *dl*-alanine improved the response of the organism to each vitamin as present in a concentration limiting growth. The improvement was very slight with riboflavin, however, and only a little more marked with pantothenic acid and nicotinic acid. With pyridoxin and folic acid the response was especially pronounced. On the folic acid-free medium a number of concentrates derived from spinach were found to differ in their relative effectiveness in promoting growth of *L. casei*, depending upon whether *dl*-alanine was present in the medium.

Effect of pseudopyridoxine on rat and yeast growth, L. E. CARPENTER, C. A. ELVEHJEM, and F. M. STRONG. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 123–125*).—Pseudopyridoxine formed from pyridoxine by autoclaving in a cystine solution or by treating with hydrogen peroxide, as well as that formed by autoclaving an acid solution of yeast extract, failed to stimulate rat growth as determined by assaying the above preparations by the method of Conger and Elvehjem (E. S. R., 86, p. 427). The pseudopyridoxine likewise failed to stimulate yeast growth, although it exerted physiological activity toward *Lactobacillus casei.* Pseudopyridoxine in the several preparations was determined, therefore, by the differential assay procedure, involving preliminary estimation of both pyridoxine and pseudopyridoxine with *L. casei* followed by determination of pyridoxine alone by the yeast method of Atkin et al. (E. S. R., 90, p. 9).

Microbiological differentiation of pyridoxine and pseudopyridoxine, B. C. JOHNSON. (Univ. Ill.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 199–201*).—Human sweat concentrated 2 to 1 was found to contain 0.0018 µg. pyridoxine per cubic centimeter by the procedure of Atkin et al., employing the yeast *Saccharomyces carlsbergensis* (E. S. R., 90, p. 9) and 4 µg. of pyridoxine equivalents of pseudopyridoxine, using the procedure of Carpenter et al. noted above and employing the bacteria *Lactobacillus casei.* The separation of pyridoxine from the pseudopyridoxine in sweat involved elimination of the pyridoxine by yeast growth, filtration of yeast cells, and assay of the filtrate for pseudopyridoxine. In a similar manner pseudopyridoxine was eliminated by bacterial growth, the bacterial cells removed by filtration, and the filtrate assayed for pyridoxine.

Inactivity of coramine (nikethamide) for L[actobacillus] arabinosus and its conversion to an active substance, L. J. TEPLY and C. A. ELVEHJEM. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 1, pp. 72–73, illus. 1*).—Nikethamide (pyridine β-carboxylic acid diethyl amide) tested on *L. arabinosus* was found to have 0.03 percent of the activity of an equimolar amount of nicotinic acid. Hydrolysis of the compound, by autoclaving it at 15 lb. pressure for 1 hr. with various concentrations of NaOH, HCl, and H_2SO_4, served to convert it to an active compound; NaOH was most effective in bringing about this conversion and H_2SO_4 the least effective. Nikethamide was less rapidly converted to an active compound than the "precursor" found in wheat bran.

Riboflavin content of milk and milk products, L. DANIEL and L. C. NORRIS. (Cornell Univ.). (*Food Res., 5 (1944), No. 4, pp. 312–318*).—The riboflavin content of 18 different dairy products was determined by fluorometric and biological procedures. The fluorometric method was essentially that of Hodson and Norris (E. S. R., 83, p. 151) and involved extraction of the samples by refluxing with an acid-acetone mixture; after filtration and removal of interfering pigments from the filtrate by treatment with $KMnO_4$ and H_2O_2 at pH 3.7, final readings on the filtrate were made photofluorometrically against a similarly treated standard riboflavin solution. The microbiological procedure used was that of Snell and Strong (E. S. R., 82, p. 587) modified to eliminate acid extraction with substitution of acid-acetone extraction or enzymatic digestion; and to remove by filtration any precipitate formed in autoclaving the sample, and by petroleum ether extraction the butterfat in samples containing more than 5 percent fat. Statistical analysis based on individual values showed that there was no significant difference between these fluorometric and microbiological methods when applied to dairy products. It is considered, therefore, that the values obtained represented actual riboflavin content. "The average riboflavin values on the fresh basis of the products studied were as follows: Dried sweet-cream buttermilk, 33.65; dried whey, 20.72; dried skim milk, spray process, 19.81, roller process, 18.81; dried whole milk, spray dried, 15.44, roller dried, 14.76; Cheddar cheese, 4.71; condensed milk, 3.95; evaporated milk, 3.57; cottage cheese, 3.00; cream cheese, 1.87; liquid whole milk, 1.77; liquid skim milk, 1.58; liquid buttermilk (cultured), 1.56; light cream, 1.47; liquid whey, 1.24; and butter, 0.367 µg. per gram."

The antiriboflavin effect of isoriboflavin, G. A. EMERSON and M. TISHLER (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 184–185, illus. 2*).—An isomer of riboflavin, 5,6-dimethyl-9-(*d*-1′-ribityl)-isoalloxazine, was found to inhibit the growth-promoting action of riboflavin for rats when this was fed in suboptimal amounts. The antagonistic effect was overcome or prevented by feeding adequate levels of riboflavin.

Thiamin content of peanut butter, T. A. PICKETT (*Georgia Sta. Cir. 146 (1944), pp. 8, illus. 3*).—Sixty samples of commercially prepared peanut butter obtained from 36 large and small manufacturers throughout the country and analyzed for thiamine by the method of Conner and Straub (E. S. R., 87, p. 9) contained from 0.3 to 3.6 µg. thiamine per gram. The average was slightly over 1 µg. per gram. One other sample fortified with thiamine equaled the specifications on the label. Riboflavin, determined by the method of Hodson and Norris (E. S. R., 83, p. 151), in eight of the samples selected at random averaged 1.35 µg. per gram (1.18–1.55 µg.). The dark-colored samples (as indicated by visual inspection and by spectrophotometric measurements of light transmission of methanol extracts of the defatted samples) contained less thiamine than light-colored samples.

Blanched peanuts with skins removed were heated in experimental lots at air temperatures of 140°, 150°, and 160° C. In a total roasting period of 15 min., more or less, a large portion of the thiamine in the peanuts was destroyed, particularly at the higher air temperature. Although a long roast at low temperatures appeared to be preferable in preserving the thiamine content, it was found very difficult, if not impossible, to obtain peanut butter with a large percentage of the original thiamine of the raw nuts without underroasting, and this practice was very detrimental to the flavor, color, and general desirability of the product.

Retention of thiamine in canned vegetables, L. E. CLIFCORN and D. G. HEBERLEIN (*Food Packer, 25 (1944), Nos. 5, pp. 32–33; 6, pp. 54, 56, 58*).—"Surveys on the effect of various steps in the preparation and canning of several vegetables reveal that blanching and processing are of greatest concern in the preservation of thiamine. The retention of thiamine during the commercial blanching of asparagus, green beans, lima beans, and peas (Alaska and sweet varieties) ranges from 64 to 100 percent and during commercial processing from 58 to 79 percent. The over-all thiamine retention for the nine products studied, based on the total contents of the can, ranges from 31 to 89 percent with an average over-all retention of 57 percent. The thiamine content of canned vegetables is significantly affected by grade and size of some of the raw products and by the segment of the stalk canned in the case of asparagus. Experiments indicate a decrease in the thiamine content of canned vegetables upon storage. The liquid portion of canned vegetables contains between 27 and 45 percent of the total thiamine in the can. This amount, together with the other water-soluble nutrients in the liquid, emphasizes the importance of utilizing this portion of the canned product in the diet."

Effect of commercial canning on the thiamine content of vegetables, L. E. CLIFCORN and D. G. HEBERLEIN (*Canner, 98 (1944), No. 17, pp. 12–15, 26*).—Essentially noted above.

Effect of canning on thiamine content of vegetables, L. E. CLIFCORN and D. G. HEBERLEIN (*Food in Canada, 4 (1944), No. 3, p. 31*).—Essentially noted above.

Influence of ingredients on thiamin content of biscuits, V. R. WILLIAMS and E. A. FIEGER. (La. Expt. Sta.). (*Food Res., 9 (1944), No. 4, pp. 328–337*).—This study was carried out to determine (1) the effect of shortening, (2) the influence of different leavening agents, and (3) the variation due to the source of vitamin for enrichment upon the thiamine content of quick breads, such as biscuits. To avoid losses of thiamine due to oven drying of the biscuits preliminary to sampling for analysis, a method was developed involving the use of 75 gm. of cut pieces (⅛ in. thick) of the biscuits and 200 cc. of 0.1 N H_2SO_4 blended for 4 min. in a Waring blender. After dilution to 500 cc., the mixture was poured into a beaker and kept homogeneous by an electric mixer during the removal of 50 cc. aliquots; after further dilution of each aliquot with 20 cc. of 0.1 N H_2SO_4, the samples were ready for hydrolysis and determination of thiamine by the method of Hennessy. Samples prepared by the new method exceeded dried samples by 0.35–16.74 (average 7.72) percent in thiamine content, and 18 to 24 hr. of time were saved in the preparation of samples. To eliminate any discrepancy due to the presence of fat, in the comparison of shortened and unshortened biscuits steapsin was added to samples in the extraction process. The steapsin (0.25 gm. per sample), introduced with the diastase and the sodium acetate buffer, made a marked difference in the character of the extracts, which attained sparkling clarity, filtered rapidly, leaving a small residue, and quickly passed through the base-exchange columns. This effected further time-saving in the analytical procedure and an increase of at least 5 percent in the assay value (after correction for the thiamine content of the steapsin) in both shortened and unshortened biscuits. No significant differences were found in the thiamine content of these two types of biscuits. Biscuits made of enriched flour and those made of enriched flour, three parts, and rice polish, one part, showed no difference in thiamine retention, about 82 percent of the thiamine value of the dry ingredients being retained in the baking process. The source of the thiamine apparently had no influence on the degree of retention. Biscuits made with the addition of rice polish averaged 8.09γ thiamine per gram dry weight as compared with 3.62γ per gram in those made from the enriched flour alone. Biscuits made with soda and lactic acid as the leavening agent (simulating sour-milk biscuits), with cream of tartar baking powder, with calcium acid phosphate baking powder, and with sodium aluminum sulfate-calcium acid phosphate baking powder showed, in that order, a decreasing thiamine content, which was associated with increasing pH of the dough mixtures.

Availability of vitamins in foods and food products.—I, Utilization of thiamin in brewers' yeasts, B. SURE. (Ark. Expt. Sta.). (*Arch. Biochem., 4 (1944), No. 3, pp. 413–418*).—In this study, the results of which are presented in a summarized form, the author, with the technical assistance of L. Easterling, conducted thiamine balance tests according to methods developed by Sure and Ford (E. S. R., 89, p. 504) on 3 sets of 24 rats each, using 3 brands of brewers' yeast with thiamine values of 440γ, 670γ, and 160γ per gram, respectively. In the first series, male and female rats 46 days old at the beginning of the experiment were used; in the second, male rats 65 days old; and in the third, male rats 34–43 days old. The first series was arranged to compare the efficiency of utilization of the thiamine of the yeast by males and females, the second to compare the utilization of the thiamine in the brewers' yeast with pure crystalline thiamine, and the third to study the influence of body weight on the efficiency of thiamine utilization in the yeast.

All series showed excellent utilization of the thiamine in the yeast, ranging from 93 to 100 percent. In the first series, the males given 50 and 150 mg. of the yeast daily showed 99.7 and 98.6 percent utilization and the females given 100 and 200 mg. daily 99.3 and 92.6 percent utilization. In the second series, there was no difference in the efficiency of utilization of the thiamine in yeast and in the pure form, but the absorption of the thiamine from the yeast was from 6 to 11 percent less than in the case of pure thiamine. In the third, variations of as much as 82 percent in initial weights and 33 percent in gains in weight during the balance studies resulted in no noteworthy differences in absorption and utilization of the thiamine, average absorption values being 88.8 percent and utilization values 97.8 percent.

Growth of rats on synthetic diets containing limiting amounts of thiamine, J. M. McIntire, L. M. Henderson, B. S. Schweigert, and C. A. Elvehjem. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 98–100, illus. 1*).—The basal ration used was composed of casein, sucrose, salts, and corn oil, supplemented with adequate amounts of pyridoxine, riboflavin, nicotinic acid, pantothenic acid, choline, and halibut-liver oil. Without thiamine this ration failed to support growth and produced polyneuritic animals. No improvement was obtained with an addition of sulfited liver extract at the 2-percent level. In the presence of thiamine at levels of 0, 60, 80, 100, and 150 mg. per 100 gm. of ration, growth response was obtained; this growth response was further increased with rations supplemented with the sulfited liver extract in addition to the thiamine, the greatest increase occurring in the rats receiving 80γ thiamine per 100 gm. of ration. The addition of *p*-aminobenzoic acid and inositol to the synthetic ration also increased the rate of growth of rats receiving suboptimum levels of thiamine.

The relation of thiamine to blood regeneration, A. R. Maass, L. Michaud, H. Spector, C. A. Elvehjem, and E. B. Hart. (Wis. Expt. Sta.). (*Arch. Biochem., 4 (1944), No. 1, pp. 105–110, illus. 2*).—Using a technic similar to that reported for demonstrating the relation between riboflavin intake and hemoglobin regeneration (E. S. R., 91, p. 224), observations were made on young and adult dogs on a highly purified ration supplemented with the crystalline B vitamins, exclusive of thiamine. Blood analyses were carried out at various levels of thiamine feeding with and without phlebotomy. The bleeding produced anemia in all dogs, and inanition and loss of weight characterized the thiamine deficiency. Less than 10µg. thiamine per kilogram body weight was inadequate for maintaining body weight of adult dogs and did not permit weight increases in the puppies comparable to those attained by litter mates on higher thiamine levels. Anemia was not associated with the thiamine deficiency, and even when this deficiency was accompanied by the strain of phlebotomy there was no disturbance of the hematopoietic function. When inanition from the continued thiamine deficiency was associated with phlebotomy, some limitation of the hematopoietic ability of the animal resulted.

Nutritional studies in tuberculosis.—III, Thiamine (vitamin B_1) deficiency and peripheral neuritis, J. E. Farber and D. K. Miller (*Amer. Rev. Tuberc., 50 (1944), No. 3, pp. 229–233, illus. 1; Span. abs., pp. 232–233*).—Seven of the 400 tuberculous patients examined for niacin and riboflavin deficiency in the previous study (E. S. R., 91, p. 624) were found to have polyneuritis in varying degree. In addition to the neuritis, 3 patients had evidence of cardiovascular involvement and 4 showed deficiency of other vitamins of the B group. Improvement in the polyneuritis, except in patients with rapidly progressive tuberculosis, followed treatment with a liberal high vitamin diet together with at least 3 oz. of powdered brewers' yeast and 30 to 50 mg. of thiamine daily in divided doses. The improvement in the neuritis was slow, requiring several months in some cases.

Ascorbic acid content, color, and palatability of fresh and processed Swiss chard and beet greens, T. PORTER, D. M. SCHLAPHOFF, M. A. WHARTON, A. M. BRIANT, and R. M. BELTZ. (Mich. Expt. Sta.). (*Food Res., 9 (1944), No. 4, pp. 268–277*).—Leaves of Swiss chard (Fordhook and Rhubarb varieties) and beets (the common table beet, Detroit Dark Red variety; and the sugar beet, U. S. 200 × 215 variety), grown under known conditions, were harvested when they had attained partially mature growth and brought immediately to the laboratory for analysis and utilization. In the storage tests a portion of the freshly harvested leaves was rinsed in a tub of water, covered with wet burlap in bushel baskets, and allowed to stand at room temperature for 24 hr. These conditions were representative of local marketing practice. The leaves, both fresh and processed, were analyzed with midribs but without petioles. Reduced ascorbic acid, determined spectrophotometrically by the Morell method (E. S. R., 87, p. 15), averaged 35 and 39 mg. per 100 gm. of fresh leaves of the Fordhook and Rhubarb spinach, respectively, and 62 and 61 mg. per 100 gm. in the sugar-beet and table-beet leaves, respectively. Holding the greens for 24 hr. in the moist condition caused no significant loss of reduced ascorbic acid. The chards cooked by home-cooking procedures in an open pan in twice their weight of boiling water until done (7–8 min.) lost 74–88 percent of their ascorbic acid, while corresponding samples cooked 21–22 min. in a covered pan, without the addition of water except that left clinging to the leaves after washing, lost 93–95 percent; beet leaves cooked by these two procedures, respectively, lost 65–71 percent and 83–84 percent. These losses included the ascorbic acid that went into the cooking water, since the cooked greens were analyzed "as eaten." The greens cooked in the moderate quantity of water not only retained their vitamin values better but also had higher color and palatability scores than the greens cooked in a minimum quantity of water. Greens cooked in 8-lb. lots, in institutional preparation, followed by 10 min. of holding on the steam table, lost 77–85 percent of their ascorbic acid; after 60 min. on the steam table losses ranged from 87–97 percent, although there was no significant change in palatability score. In the cooking tests, both varieties of Swiss chard ranked higher on palatability scores than either the red-beet or sugar-beet leaves. Drying in a small home drier resulted in greens with very low, or no, reduced ascorbic acid content. These dried leaves were unpalatable when reconstituted and cooked. Alcohol-extracted pigment, determined by the method of Petering et al. (E. S. R., 83, p. 438), showed a highly significant correlation with either palatability or color as scored by the judges.

Ascorbic and dehydroascorbic acid in cooked garden beets, E. KELLY and F. W. CHRISTENSEN. (N. Dak. Expt. Sta.). (*Science, 100 (1944), No. 2594, p. 248*).—Beets of the Detroit Blood Red variety of the 1943 crop held in a ventilated vegetable storage cabinet from October 1943 to July 1944 contained 12.6 mg. of reduced ascorbic acid and 13.1 mg. of the dehydro form per 100 gm. fresh basis, as compared with 17.5 and 8.4 mg., respectively, for freshly harvested beets of the 1944 crop. These results, although based on different crops, suggest a considerable change of ascorbic acid to the dehydro form during storage, without any appreciable destruction.

Ascorbic acid value of the sweet potato as affected by variety, storage, and cooking, M. E. HOLLINGER. (La. Expt. Sta.). (*Food Res., 9 (1944), No. 1 pp. 76–82*).—After preliminary attention to the development of sampling details, ascorbic acid was determined in 25-gm. wedge-shaped samples taken from end to end of the unpared sweetpotato. Two such slices from each of five representative sweetpotatoes were extracted immediately with 3 percent metaphosphoric acid in a Waring blender and the extracts composited. Ascorbic acid was determined in the extract by titration with 2,6-dichlorophenolindophenol.

Ascorbic acid in four standard and three seedling varieties ranged from 0.235 mg. per gram for Triumph to 0.333 mg. per gram for Nancy Hall in samples taken during the first month after harvest. Tests suggested that the ascorbic acid content of the sweetpotatoes is a variety characteristic worthy of consideration in breeding. Varietal differences tended to become less significant after storage, however, since ascorbic acid decreased in storage and the losses were greater in varieties with higher initial ascorbic acid values. Losses ranged from 28–40 percent after 7-mo. storage (October to May) at 60°–80° F., and the ascorbic acid content of the potatoes then ranged from 0.166 mg. per gram for Triumph (5-mo. storage) to 0.203 mg. per gram for Nancy Hall.

Pared sweetpotatoes cooked by boiling in water or a sugar solution, and by steaming in a pressure saucepan, and samples baked and boiled without paring retained from 69–83 percent of their original ascorbic acid value. The highest retention was in the pressure saucepan. The lowest was in boiling after peeling; the presence of sugar in the boiling water exerted a favorable effect, however, and resulted in a 74 percent retention. In the boiling tests 15–19 percent of the ascorbic acid was found in the cooking water and about 11 percent was actually destroyed.

The content and stability of ascorbic acid in orange juice under home conditions, V. ROHRER and C. R. TREADWELL (*Tex. Rpts. Biol. and Med., 2 (1944), No. 2, pp. 175–182*).—Ascorbic acid was determined by the method of Harris and Oliver (E. S. R., 89, p. 625) in juice from oranges purchased on the retail market at Dallas, Tex., in January and February 1944. The method of reaming, whether with a hand reamer, a Universal press, or a Mixmaster, made little difference in the ascorbic acid content, juices freshly reamed by the several methods containing 0.5–0.7 mg. ascorbic acid per cubic centimeter. Storage in the refrigerator, either in an open or a closed container, had no significant effect on the ascorbic acid content of strained (through a wire-meshed strainer) or unstrained juice over a 24-hr. period; after 72 hr. of storage, however, the loss amounted to 20 percent. Dilution of the orange juice one-third with tap water did not hasten the destruction of ascorbic acid during refrigeration. Even storage at room temperature for 24 hr. or holding at 100° F. for 10 min. had little effect on the ascorbic acid content of the orange juice. Cut halves of oranges stored with cut surface exposed for 24 hr. in the refrigerator likewise showed but little loss of ascorbic acid as compared with control halves analyzed when the oranges were cut.

Vacuum sealing will retain vitamin C in evaporated milk, F. J. DOAN and D. V. JOSEPHSON. (Pa. Expt. Sta.). (*Food Indus., 16 (1944), No. 5, pp. 91–92, 136–137, illus. 2*).—In an effort to compensate for the previously observed loss of ascorbic acid in the processing and storage of evaporated milk (E. S. R., 91, p. 491), laboratory-prepared batches were fortified upon concentration, but before sterilization, with pure ascorbic acid as the rate of 50 mg./l. (to a final concentration of about 63 mg./l.) on a fluid-milk basis. The fortified milk, in 14.5-oz. cans, under vacuum seal or under nitrogen seal, retained the ascorbic acid pretty well, as much as 45 to 47 mg./l. fluid basis being retained even after 6 months' storage. Without this protective seal the normally sealed fortified milk lost ascorbic acid rather rapidly at first, dropping to about 39 mg./l. fluid basis in 1 mo. and gradually to about 34 mg./l. in 6 mo. The presence of excess air, as in normally sealed, underfilled cans, resulted in rapid and drastic reduction in ascorbic acid, not more than about 12 mg./l. fluid basis remaining after 6 months' storage. This was but little more than the amount found in normal milk under nitrogen seal (about 11 mg./l.). Preliminary trials showed that the nitrogen seal favored ascorbic acid retentions in normal evaporated milk. The advantages of sealing the fortified milk in the absence of air were carried over even after opening the can; such milk, held in the refrigerator in the can for 7 days after opening (by punching two holes in the top), still contained on an average 33.6 mg. ascorbic acid per liter, fluid basis.

The physiologic significance of vitamin C in man, M. PIJOAN and E. L. LOZNER (*New England Jour. Med., 231 (1944), No. 1, pp. 14–21*).—In this review the authors purposely limit the scope of the research covered to the examination of two theses "that the only known lesion caused by vitamin C deficiency is the scorbutic process; and that the evaluation of ascorbic acid deficiency in any given person from an assay of his usual diet is untrustworthy." From the evidence presented, covered by 87 citations including 3 references to unpublished work of the senior author, the following conclusions are drawn:

"The use of ascorbic acid, either synthetic or in the diet, is for the prevention or treatment of scurvy. With the possible exception of its influence on amino acid metabolism in premature infants, no other role can be ascribed to the vitamin. A diet cannot be condemned as deficient in this vitamin unless a continued linear decline of the content of the vitamin in the whole blood, white cell-platelet layer, or other tissue takes place, the appearance of scurvy being conclusive evidence. Relatively small amounts of the vitamin—possibly 25 mg. or under a day—are necessary to maintain fixed blood or white cell-platelet levels. Any fixed level of the vitamin in the plasma, irrespective of how little is present, indicates a non-scorbutic process and a positive body economy."

Some experiments on the possible relationship between vitamin C and calcification, G. H. BOURNE (*Jour. Physiol., 102 (1943), No. 3, pp. 319–328, illus. 10*).—Bone calcification, as indicated by pink coloration of newly deposited bone salt in animals receiving the dye sodium alizarin sulfonate, was followed in normal and regenerating bone of guinea pigs on a scorbutic diet with and without injected supplements of ascorbic acid. The regenerated bone was that formed after a 1-mm. hole was bored aseptically in each femur by the method described by Bourne (E. S. R., 89, p. 776). The deposition of bone salt in both the normal and regenerating bone was found to be retarded in scurvy, but administration of the pure synthetic ascorbic acid permitted the calcification to take place. The administration of vitamin P (citrin) and sodium citrate did not result in the formation of more osteoid trabeculae or the deposition of more bone salt than did ascorbic acid alone. Histological sections prepared without decalcification from pieces of rib (including the costochondral junction) taken from animals that had been kept on a scorbutic diet, with and without daily ascorbic acid supplements, were treated by Gomori's phosphatase technic. The black stain observed at sites of phosphatase activity indicated that the amount of phosphatase present in costochondral junctions was reduced in scorbutic animals. It is considered likely that one of the functions of ascorbic acid is to allow the production of a phosphatase-impregnated bone matrix upon which bone salt is deposited. Ascorbic acid may play some part in the formation or stabilization of alkaline phosphatase.

Effects of cecectomy, succinylsulfathiazole, and p-aminobenzoic acid on vitamin K synthesis in the intestinal tract of rats, H. G. DAY, K. G. WAKIM, M. M. KRIDER, and E. E. O'BANION (*Jour. Nutr., 26 (1943), No. 6, pp. 585–600*).—Young cecectomized rats on a basal diet free of vitamin K but containing yeast showed a high incidence of hypoprothrombinemia when fed 1 percent sulfasuxidine (**I**), whereas similar animals not receiving **I** and unoperated animals on the basal diet with **I** exhibited a low incidence of hypoprothrombinemia. The hypoprothrombinemia was readily alleviated by feeding 2-methyl-1,4-naphthoquinone. With adequate diet the cecectomized rats maintained good nutritional status. These results indicated that the cecum is an important site of vitamin K synthesis, but that this vitamin can be formed in other parts of the intestinal tract. Development of hypoprothrombinemia and restricted growth resulted when young rats on a purified diet containing B vitamins but no *p*-aminobenzoic acid (**II**) were fed 1 percent of **I**. Since addition of **II** markedly reduced these manifestations, it appeared that this compound counteracted the effect of **I** on vitamin synthesis in the intestinal tract.

TEXTILES AND CLOTHING

The utilization of wool by four saprophytic micro-organisms in the presence of additional nutrients, D. J. Hirschmann, M. Zametkin, and R. E. Rogers. (U. S. D. A.). (*Amer. Dyestuff Rptr., 33 (1944), No. 17, pp. 353–359, illus. 2*).—"The growth of four saprophytic micro-organisms, *Bacillus mesentericus, B. subtilis, Actinomyces albus* variety, and *Chaetomium globosum,* was studied by macroscopic and microscopic examination in the presence and absence of degreased, steam-sterilized wool fabric using the following liquid media: Czapek's, Czapek's without sucrose, Czapek's without $NaNO_3$, and Czapek's with both sucrose and $NaNO_3$ omitted. The same media were used in the solid form by adding agar to the various liquids. Distilled water and water agar were used as controls. Also the effect of adding an aqueous wool extract to the various liquid media was determined.

"Czapek's solution and Czapek's agar supported from good to excellent growth of the four organisms. In general, there was considerably less development in the incomplete Czapek's substrates than in the full Czapek's solution or agar but more than on the water agar. The latter supported either no growth or scant to fair growth. In distilled water, the micro-organisms did not grow except in the case of *C. globosum.*

"The four test organisms grew when the wool fabric or the wool extract was added to distilled water. The addition of wool fabric to Czapek's and the incomplete solutions stimulated the development of each organism in each media at some time during the incubation period. Also the presence of the wool extract enhanced the growth of each organism in Czapek's and the incomplete solutions.

"When the wool fabric was added to the solid media, microscopic examination revealed a stimulation of growth at the ends of the cut fibers on all media inoculated with *B. mesentericus* and *B. subtilis,* indicating diffusion of nutrients from the cut ends. Because of the preferential development of *C. globosum* and *A. albus* on the fabric, the stimulation at the ends of the fibers was not very apparent in these cases.

"Degreased, steam-sterilized wool, in the absence of added nutrients, was resistant to attack by three of the test organisms, namely *B. mesentericus, B. subtilis,* and *A. albus.* Under the conditions of these experiments only one organism, *C. globosum,* grew on the wool in the presence of distilled water alone. However, this growth was limited, being only fair at the end of the incubation period.

"*A. albus* grew on the wool in the presence of Czapek's and the incomplete Czapek's media and water agar and was the most active of the organisms in disintegrating wool fiber. Only in the presence of distilled water did this organism fail to grow or cause fiber damage. *C. globosum* grew on all the solid and liquid media and the controls but disintegrated the fiber less than *A. albus.* Only on Czapek's solution or agar did *B. subtilis* grow on wool and cause considerable fiber injury. *B. mesentericus* grew on the wool only on Czapek's agar in the test tube experiment and caused but slight fiber deterioration.

"Wool fiber is relatively resistant to the four test organisms. However, the soluble products resulting from the hydrolysis of wool are readily utilized by these organisms. The extent of fiber disintegration is influenced by the type of organism and the presence of added nutrients."

Resistance of fabrics and yarns to insect pests, J. R. BONNAR (*Amer. Dyestuff Rptr., 33 (1944), No. 13, pp. P266–P269*).—This report presents the results of cooperative tests for determining the degree of insect damage to treated and untreated fabrics. It was agreed "that the report of visual damage was the only reported damage which held true from laboratory to laboratory. It was agreed that within each laboratory the figures on either Excrement Weight Method or Fabric Loss Method did not vary greatly, but that the differences from one laboratory to another were too great for comparison."

Determination and evaluation of the resistance of textiles to insect pests, H. E. WILDE (*Rayon Textile Mo., 25 (1944), No. 9, p. 128*).—This report considers briefly the methods available for evaluating moth resistance of treated fabrics, the limitations of the methods, and the findings and conclusions of the various laboratories cooperating in a comparison of these methods. The visual method, certain details of which are outlined, was found the most satisfactory, as noted in the above report of the study. It is pointed out, however, that much work still remains to be done before final standards can be adopted.

Effectiveness and permanence of certain moisture-repellent and stain-resistant finishes, V. M. CROUCH and K. P. HESS. (Kans. Expt. Sta.). (*Rayon Textile Mo., 25 (1944), No. 9, pp. 103–105, 106, illus. 4*).—Of the two finishes tested one was a so-called permanent finish (I) produced by heating the fabric with a long-chain quaternary ammonium compound and the other was a wax-emulsion type of nonpermanent finish (II) applied during the laundering processes in a concentration of 2–6 oz. per gallon of water or precooked starch at a temperature of 100°–120° F. These two finishes were compared for their moisture-repelling and stain-resisting effects on two cotton poplins, a cotton broadcloth, and an organdy, and for their permanence to laundering and dry cleaning. The amount of moisture that passed through the fabric (rather than that absorbed by it) in definite periods of time, under known pressures, was taken as a measure of the water repellency of the fabrics and was measured by a modified wet disk method of water absorption. Moisture penetration and stain resistance of the fabrics were measured by means of a spray-device apparatus described and illustrated. A comparison of the physical characteristics of treated and untreated fabrics showed that (I) reduced the breaking strength and stretch of the fabric, but that this was not true of (II).

Finishes (I) and (II) imparted equal water-repellent and stain-resistant properties to the fabrics but varied in their permanence under laundering and dry-cleaning processes. The high degree of repellency imparted to the fabrics by (I) was not noticeably reduced in 10 launderings, but resistance to moisture and stain decreased markedly after 5 dry cleanings. Originally, however, this finish gave the fabric a high degree of resistance to staining with coffee and grape juice but not to ink. The slight staining from coffee and grape juice was easily removed from the dry-cleaned portions.

The repellency imparted to the fabrics by (II) was destroyed by 10 launderings and 5 dry cleanings. Stains caused by coffee and grape juice were removed by rinsing in cold water; stains in the dry-cleaned fabrics were most difficult to remove. Ink stains in all fabrics resisted removal by rinsing in cold or hot water and by home laundering in warm soapsuds; commercial laundering was required for ink-stain removal. This latter treatment removed the moisture-repellent properties of (II) but had little effect on (I).

Rayon—a product of American chemurgy, L. WHITNEY (*Rayon Textile Mo., 25 (1944), No. 9, pp. 59–62, illus. 1*).—This is a summary of recent events in the rayon industry, including the development of new war uses for rayon.

Serviceability of linen, cotton with a permanent finish, and rayon/cotton table napkins, L. E. SUMNER and E. D. ROSENBERRY. (Purdue Univ.). (*Rayon Textile*

Mo., 25 (1944), No. 8, pp. 53–56).—"Linen, cotton with a permanent finish, and rayon and cotton napkins, at different price levels, were put into service in a college dining hall where they were used over a period of 32 weeks, during which time each napkin was used by one person for 3 days of each week and then laundered in the school laundry.

"The deterioration was greatest in the linen napkins, as is indicated by both loss in breaking strength and weight per square yard. This is probably due to the brittleness of the fiber which causes it to slough-off in laundering. The amount of deterioration that takes place, and the appearance of the linen napkins after use, seem to depend to a great extent on the quality of the fibers which are used in constructing the napkin. In general, deterioration, as measured by loss in breaking strength, was less in the cotton fabrics with the permanent finish than in the linen fabrics. The finish was still effective in preventing linting and in giving a firm handle to the fabric after 32 launderings. It had an appreciable effect in decreasing the strength losses of cotton yarns during use, as indicated by a comparison with the cotton yarns of rayon and cotton fabrics which had no finish. This study, however, does not show that the permanent finish prevented or decreased shrinkage of the cotton napkins.

"The rayon and cotton napkins gave satisfactory wear, were cheaper than the linens, and would give longer wear if the hems had been of better workmanship. The most expensive and the one judged to be the best quality from its construction and laboratory performance was just as attractive after 32 launderings as when new, and it showed less deterioration in either its cotton or rayon yarns than any other fabrics, judged by loss in breaking strength. The rayon yarns of all of the rayon and cotton fabrics resisted deterioration more than the cotton and linen yarns used in the fabrics in this study.

"The shrinkage in laundering of the fabrics under laboratory conditions did not predict the shrinkage under actual laundering conditions which existed in the college dining hall. Even though the temperature of the water was higher by approximately 50° in the laboratory laundering, the shrinkage was not as great."

Sterilization in the power laundry, J. F. OESTERLING, C. R. PHILLIPS, J. F. KRAWIEC, P. B. MACK, M. A. FARRELL, and S. HOYNAK (*Pa. State Col. Bul., 37 (1943), No. 32, pp. 10+*).—Experimental tests and commercial and institutional trials showed that in laundry practice soap and water at high temperatures, sodium hypochlorite in small concentrations, and the ordinary laundry souring agents (acid sodium fluoride or acetic acid), as well as special sterilizing sours, all induced a sterile condition in fabrics and textiles contaminated with the general run of bacteria. A combination of soap and water, at high temperature, and either sodium hypochlorite or sour or both produced complete destruction of the bacteria present. Soap and an alkaline builder in concentrations and at temperatures commonly used in the power laundry were found to be germicidal agents for the three pathogenic organisms tested (*Staphylococcus aureus, Eberthella typhosa,* and *Clostridium welchii*). Sodium hypochlorite or hydrogen peroxide in low concentrations as used with soap in power laundry procedure also produced complete destruction of these organisms. Water at 160° F. produced complete or almost complete destruction in the three cases, but laundry sour was a good sterilizer with *E. typhosa.* The general procedure recommended for the use of commercial and institutional laundries, namely, an initial suds with a low titer soap, three or four heavy suds baths with high titer soap, with low concentrations of an oxidizing agent such as sodium hypochlorite or hydrogen peroxide in the last suds, followed by a series of rinses, with or without a souring bath, was found to produce complete destruction of the bacterial organisms ordinarily encountered and of the three pathogenic organisms studied.

The value of dry-cleaning to public health (*Pa. State Col. Bul., 37 (1943), No. 26, pp. 4+*).—The sterilizing effect attained after various stages in the standard dry-cleaning procedure was investigated with test squares of new wool originally not sterilized and of new wool originally sterilized by the method of Humfield et al. (E. S. R., 78, p. 432) and then inoculated with *Eberthella typhi* or *Diplococcus pneumococci* prior to dry cleaning. Following the various steps of the dry-cleaning process, the test squares were dipped in 9 cc. of sterile water, which was then plated out and examined to determine plate counts of bacterial colonies developing. From the percentage reduction in bacterial count following the various treatments it was apparent that the complete dry-cleaning process, involving the use of a dry-cleaning soap, rendered the textile fabrics sterile to the general run of contaminating bacteria, as present on the unsterilized wool, and to the pathogenic organisms as well. Neither heat alone at the temperature most commonly used in drying fabrics during dry cleannig (120° F.) nor dry-cleaning solvent (Stoddard Solvent) without soap or other detergent was effective in producing complete sterilization. A sulfonated oil type of detergent or the usual oleate dry-cleaning soap produced complete sterility in combination with the standard dry-cleaning procedure. It is concluded, therefore, that dry cleaning must be regarded as of value to public health.

Dresses and aprons for work in the home, C. L. Scott and E. Bruzgulis (*U. S. Dept. Agr., Farmers' Bul. 1963 (1944), pp. 16, illus. 33*).—The dresses and aprons, designed to meet the requirements of actual use, permit of free action; offer safety features for work around the stove, for stooping, and for getting up and down on chairs or ladders; and offer time and energy-saving features that make the garment quick and easy to put on and to iron. Useful pockets, placed within convenient reach, and simplicity and attractivenesss are the additional features. It is noted that commercial companies have reproduced these designs in patterns, thus making them available to home sewers.

HOME MANAGEMENT AND EQUIPMENT

Lighting the home with liquid fuels, L. J. Peet and R. P. Koch. (Iowa State Col.). (*Jour. Home Econ., 36 (1944), No. 6, pp. 354–358*).—In this study of the adequacy of liquid fuel lamps usually obtained on the market, three types of lamps with a variety of shades were used in measurements with a Weston Sight Meter of illumination under the lamps. These included (1) mantle-wick kerosene-burning lamps, comprising two table lamps of different heights, a bracket lamp, a hanging lamp, and a floor lamp; (2) mantle-wick vapor-pressure lamps, including one using kerosene and one gasoline as fuel; and (3) straight- and round-wick kerosene lamps, including two table and one bracket. In addition to laboratory tests, selected lamps were taken to a home where electricity was used to light the living room and readings were taken for comparison with IES electric lamps. Various combinations of lamps were also tested in this home and in a rural home where electricity was not available.

Practical recommendations for manufacturers resulting from the study are to (1) use more heat-resistant material for the handles by which the flow of the vaporized fuel in the vapor-pressure lamps is regulated, and (2) continue making shades of fire-resistant material but provide white linings and large lower diameters. Recommendations to consumers are to use shades on all lamps to eliminate glare and increase illumination under the lamp, to select shade materials and a form of construction facilitating cleaning, to keep vapor-pressure lamps pumped to the highest pressure possible, and to turn the wicks of mantle-wick lamps as high as possible without causing blackening of mantle. "For a 200-sq.-

ft. floor area in a room used for general living activities use a minimum of three shaded lamps, one for general illumination, the other two for local light—two mantle-wick lamps and one vapor-pressure lamp, or one mantle-wick, one round-wick, and one vapor-pressure lamp."

REPORTS AND PROCEEDINGS

[Annual reports of the North Dakota Agricultural Experiment Station, 1938, 1939, 1942, 1943] (*North Dakota Sta. Rpts. 1938, pp.* [*21*]; *1939, pp.* [*21*]; *1942, pp. 31+*; *1943, pp. 34+*).—These mimeographed reports include for 1938 and 1939 only administrative information; those for 1942 and 1943 also report progress results for the respective years, for the most part previously noted.

Report of agricultural research and other activities of the Western Washington Experiment Station for the fiscal [years ended March 31, 1941, and March 31, 1942], J. W. KALKUS ET AL. (Partly coop. Wash. Expt. Sta. and U. S. D. A.). (*Western Washington Sta. Rpts. 1941, pp. 70, illus. 1; 1942; pp. 70*).—These reports give brief summaries of research work and other activities carried on, respectively, for these fiscal years, together with results for some projects for the following summer seasons.

The data for 1941 include results in agronomy with alfalfa inoculation and variety tests, hay ventilation, selections of grasses and legumes, hardiness in oats, control of Bracken fern, and culture of flat peas and pyrethrum; in dairy husbandry, with analyses of hays, silages, and pasture grasses, measures of pasture yields, liquid manures and fertilizers for pastures, stack silage, and roughage v. roughage plus concentrates for dairy cattle; in entomology, including the control of the cherry fruitworm, holly insects, Lecanium scale on sour cherries, and pear thrips; in horticulture, including breeding of strawberries, raspberries, blackberries, and dewberries, variety tests with peaches, blueberry investigations, freezing studies with peas and sweet corn, varieties of potatoes, sweet corn, and melons, and vegetable seed production; in plant pathology, including bulb diseases, raspberry mosaic, brown rot of stone fruits, net necrosis, bacterial ring rot of potato, cabbage seed diseases, and running-out diseases of strawberries; in poultry husbandry, including disease resistance, feeding and management, vitamin A requirements of laying hens, effect of salt on cannibalism, inheritance of slow feathering and eggshell quality, and yolk absorption in chicks; in soils, including phosphates for western Washington, fertilizers and inoculants for freezing and canning peas, boron deficiency of alfalfa, fertilizers for potatoes and small-grain hays, potash deficiency of Blue Lake beans, and soil adaptability and fertilizer studies; and in veterinary science, including work with fowl pox, feeding a 32-percent mash to pullets artificially infected with intestinal coccidia, and leucosis in poultry.

The data for 1942 include results in agronomy, including variety tests and boron deficiency tests with alfalfa and other crops, Russian dandelion plantings, fertilizer placement and rates for peas, table beets, spinach, carrots, sweet corn, and potatoes, inoculation of canning and freezing peas, and phosphates for western Washington soils; in dairy husbandry, including work with proved sires, liquid manures and supplements for pastures, roughage v. roughage plus concentrates for dairy cattle, and preserving roughages in the farm silo; in entomology, including the control of the pear thrips, cherry fruitflies, cabbage seed weevil, *Sitona* weevil (*S. lineata*), and bulb flies and mites; in horticulture, including breeding strawberries and raspberries, blackberry hybrids, peas, and potatoes, varieties of potatoes, peaches and other fruits, and nuts, propagation of trees and shrubs by cuttings, and seed production of cabbage and beets; in plant pathology, including cabbage seed diseases, raspberry mosaic, bulb diseases, footrot of peas, and running-out diseases of strawberries; in poultry husbandry, including studies of disease resistance, effect of salt on cannibalism, feeding and management of breeding hens (including riboflavin supplements) and laying hens (including vitamin A requirements), development of new chick rations, inheritance of eggshell quality, egg dehydration, and methods of "blacking-out" poultry houses; in veterinary science, including avian leucosis, treatment of infectious coryza in chickens with sulfathiazole, efficiency of a delousing leg band, and erysipelas and fowl pox in turkeys; and grazing studies on cutover lands, including a test with Elbe flat peas.

MISCELLANEOUS

A source-book of biological names and terms, E. C. JAEGER (*Springfield, Ill.: Charles C. Thomas, 1944, pp. 256+, illus. 94*).—This lists alphabetically fully 12,000 elements from which biological names and terms have been derived, together with their origins, meanings, and many examples of their use.

Biology as an approach to a sound philosophy, C. C. DOAK. (Tex. A. and M. Col.). (*Tex. Acad. Sci. Proc. and Trans., 27 (1943), pp. 73–79*).

Five and fifty years, 1888–1942, J. L. HILLS (*Vermont Sta. Bul. 515 (1944), pp. 56, illus. 16*).—This is a history of the Vermont Station, developed and enlivened by the author's long and intimate association and leadership (E. S. R., 86, p. 433). Considerable little-known material relating to the pre-Station period has been included.

Bimonthly Bulletin, [September-October 1944] (*North Dakota Sta. Bimo. Bul. 7 (1944), No. 1, pp. 26, illus. 3*).—In addition to articles noted elsewhere in this issue, this number contains Agricultural Changes Elsewhere Affect North Dakota Agriculture (p. 2) and A Look Ahead—The Weather and the 1944 Grain Crop and How It May Affect the 1945 Grain Crop (pp. 3–4), both by H. L. Walster; Flax, Wheat, and Chromosomes, by L. R. Waldron (pp. 4–5); Palatability of Grasses Grown at Mandan, North Dakota, by H. L. Walster (pp. 6–7) (coop. U. S. D. A.), an abstract of an earlier article by Rogler (E. S. R., 91, p. 674); and Report of the Veterinary Diagnostic Laboratory, July 1, 1943-June 30, 1944, by J. O. Foss (pp. 14–17).

NOTES

Connecticut State Station.—Lt. Col. M. F. Morgan, chief agronomist since the organization of the department in 1923 and on military leave since 1942, was killed in action on the island of Leyte on January 15. He had previously served in World War I, receiving both the Distinguished Service Cross and the Croix de Guerre.

Born in West Virginia in 1895, he had graduated from the West Virginia University in 1920, and subsequently received the M. S. and Ph. D. degrees from Ohio State University. Before coming to Connecticut he had served on the soils staffs of both of these institutions, and from 1927 to 1933 was also associate professor of forestry in the Yale School of Forestry. He had achieved much distinction as a research agronomist, both as the author of the widely known Morgan method of soil testing and for his contributions to soil classification, lysimeter investigations, and microchemical soil tests, forest soils, and the utilization of fertilizers by tobacco and vegetable crops. He was president of the Soil Science Society of America in 1933 and had been secretary of Section O (Agriculture) of the American Association for the Advancement of Science since 1936.

Illinois University.—Dr. William Trelease, emeritus professor of botany since 1926, died on January 1 in his eighty-eighth year. He came to the university in 1913 and had also been associated with the U. S. Department of Agriculture as a special agent on cotton insects, the University of Wisconsin, Harvard University, Johns Hopkins University, and Washington University of St. Louis, where he opened the Shaw School of Botany in 1885 and served as director of the Missouri Botanical Garden from 1889 to 1912. He was the first president of the Botanical Society of America in 1894–95 and was again president in 1918. Among his many publications were his manuals on Plant Materials of Decorative Gardening (1917), Winter Botany (1918), and The American Oaks (1925).

Kansas College.—In conformity with the efforts of the Office of Defense Transportation to restrict travel, the 1945 Farm and Home Week scheduled for February 6–9 was canceled, causing the second omission of this series since the opening of Farmers' Institutes in 1877. In its stead a Farm and Home Week of the Air was presented beginning February 6.

Kentucky Station.—Dr. Clifford Westerfield has been appointed associate animal pathologist.

Michigan College and Station.—An Institute of Nutrition has been established, with an administrative committee consisting of C. F. Huffman, professor of dairying as chairman, Dean R. C. Huston of the Graduate School, Director V. R. Gardner of the experiment station, Margaret A. Ohlson, head of the department of foods and nutrition, and C. L. Cole, C. A. Hoppert, and W. L. Mallmann, professors, respectively, of animal husbandry, biochemistry, and bacteriology. Its objectives are outlined by the committee as (1) to better establish the college as a research center of foods and nutrition, (2) to provide an organization for graduate training in foods and nutrition, and (3) to better serve the consumer, the farmer, and the feed and food industries. It is planned to coordinate and integrate instruction and research in nutrition and to supply a contact between the college and industry. The institute will receive aid for maintenance from the college, and it is hoped that industry and trade and agricultural organizations will provide grants for research and industrial fellowships.

New Mexico College and Station.—Clarence P. Wilson, associated with the college since 1912 and station editor since 1925, died January 19 at the age of 66 years. A native of Missouri, he was graduated from the college in 1908 and received the M. S. degree in 1911. He had been especially interested in problems of range improvement.

New York State Station.—Arthur W. Clark, retired on December 31, 1944, as professor of chemistry after a continuous service since July 1, 1905. He had been in charge since 1914 of the chemical inspection of commercial feeding stuffs and fertilizers.

North Carolina College and Station.—Dr. R. W. Cummings, head of the department of agronomy, has also been appointed assistant director of the station. Dr. C. H. Bostian, professor of zoology and associate in poultry genetics research, has been made assistant director of instruction in the College of Agriculture. Other appointments include James H. Hilton, assistant chief of the department of dairy industry in the Indiana Station, as head of the department of animal industry; James H. Jensen, associate professor of plant pathology in the University of Nebraska, as professor and head of the section on plant pathology; John Willis Weaver, Jr., as associate in agricultural engineering in the station; and H. Brooks James as associate in agricultural economics in the station.

Oklahoma Station.—A grant of $20,000 from commercial sources has been received for research on the mineral requirements of range beef cattle. This will be used to expand work on this subject now under way on the station's 4,500-acre experimental range near Stillwater and to check the results in other parts of the State.

Pennsylvania College and Station.—Dr. Dennis E. Haley, professor of soils and phytochemistry, died February 10 at the age of 59 years. A native of Ohio, he received from the Ohio State University the B. S. degree in 1913 and the Ph. D. degree in 1932. He has been associated with chemical research in Pennsylvania since 1914, working on problems in agricultural chemistry and biochemistry, notably with tobacco, soil potassium, and castor-bean lipase.

Dr. Donald V. Josephson, assistant professor of dairy manufactures, has been appointed associate professor of dairy technology in Ohio State University.

Utah College and Station.—Recent appointments in animal husbandry include Dr. Louis L. Madsen, nutritionist with the U. S. D. A. Bureau of Animal Industry, as head of the department; Dr. Lorin E. Harris, research instructor in animal nutrition in the Cornell Station, as associate professor; and Dr. Carroll I. Draper, associate professor of poultry husbandry in the University of Hawaii, as associate professor of poultry husbandry.

Washington College and Station.—Dr. Wilson Compton has assumed the presidency of the college.

The resignations are noted of Carl N. Berryman and William A. Harvey as assistants in agricultural economics and agronomy, respectively, the former to accept a commercial position in Yakima, Wash., and the latter a position with the California Station. Recent appointments include Walter M. Bristol as field assistant in agricultural economics; J. Frank Cone as assistant dairy husbandman; Dr. Hazel Cushing as specialist in family living and child development; W. H. Johnson as instructor in agricultural engineering vice O. J. Trenary resigned to accept a commercial position; Dr. James McGinnis as assistant poultryman and assistant chemist; and Dr. E. H. Peterson as associate veterinarian.

Wisconsin University and Station.—Dean and Director E. B. Fred of the College of Agriculture and Station has been appointed president, effective February 15.

Wyoming Station.—Under an Act of Congress approved December 15, 1944, 24 acres of land at Powell belonging to the Federal Government have been transferred to the station for use as an agricultural experiment substation.

U. S. Department of Agriculture.—Dr. E. C. Auchter, Agricultural Research Administrator, has been appointed director of the Hawaiian Pineapple Research Institute and has been succeeded by P. V. Cardon, formerly Assistant Administrator.

David Lumsden, from 1922 until his retirement in 1941 a horticultural inspector for the Bureau of Entomology and Plant Quarantine in connection with the identification and handling of plant material, died January 22 in his seventy-fourth year. A native of England and with many years of practical experience as a landscape architect, he served as instructor in horticulture and landscape art in the New Hampshire University from 1908 to 1914 and as assistant professor of floriculture in Cornell University and the Cornell Station from 1914 to 1919 and as director of agricultural reconstruction and landscape architecture at Walter Reed General Hospital from 1919 to 1922. Some of his best known research work was with fertilizers for carnations and the breeding of orchids.

Brazilian National Agricultural Center of Education and Research.—This comprehensive project, which has been under development for 6 years, was scheduled to be opened early in 1945. Commonly known as "Kilometer 47" because of its distance from Rio de Janeiro, the center will comprise Brazil's largest agricultural experiment station, an agricultural college, a boys' training school, and many special educational projects. The National School of Agronomy and the National School of Veterinary Medicine, now scattered over the city of Rio de Janeiro, will be transferred to the center, as well as a number of research laboratories including the Institute of Ecology and Agricultural Experimentation, the Institute of Agricultural Chemistry, the National Institute of Oils, and the Institute of Fermentation. The Agricultural Institute will be coordinated with the various Federal agricultural institutes which conduct a series of experimental stations in Brazil.

A tract of 10,750 acres has been set aside for the center, of which 310 are in experimental plantings of fruits, cereals, fiber plants, oil-bearing shrubs and trees, and forest trees. Laboratories are already operating in the departments of silk culture, poultry, apiculture, farm mechanics, meteorology, and biology. Some buildings are occupied, and others are being completed, including a central building covering with its patio about 2.5 acres, with facilities to accommodate 1,200 students.

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Attempts to isolate the suspected causal organism were inconclusive. *Leptospira* were present in focal accumulations in certain organs, although also scattered outside the main organic foci. The association of massive foci of *Leptospira* with the principal pathologic changes is believed to characterize the reported cases as bovine leptospirosis.

The features of early mastitis in heifers during the first lactation, J. F. MALCOLM, C. W. KING, and M. M. CAMPBELL (*Vet. Rec., 56 (1944), No. 27, pp. 227–230*).—To obtain information as to the etiology of bovine mastitis, 28 heifers in a tuberculin-tested herd were kept under clinical observation throughout their first lactation, and specimens of milk from individual quarters were examined at weekly or fortnightly intervals for leucocyte content, electrical conductivity, and specific pathogens. Twelve of the heifers remained normal and without any evidence of mastitis throughout the lactation, although *Staphylococcus aureus* or *albus* was occasionally found in the milk of one or two quarters, and similarly *S. agalactiae* in one instance. Four heifers showed various abnormal conditions of the udder which appeared to be due to lactational or other factors of a nonspecific nature. Twelve other heifers developed mastitis or udder disturbances during the lactation, 8 being clinical cases and 4 subclinical. In all, *S. aureus* or *albus* was found at some time or other in the milk of the affected quarters, but in only 5 heifers were these staphylococci found so frequently or in such numbers as to indicate the possibility of a staphylococcal infection. In 5 of the remaining 7 cases no staphylococci could be found even by enrichment methods in the milk of the affected quarters for a period of 1 to 3 mo. after the initial rise in cell count and conductivity, which were the first indications of disease. In spite of the fact that *S. agalactiae* was associated with cases of mastitis in the older cows of the herd during the same period and the organism was found occasionally in the milk of the heifers, there were no cases attributable to *S. agalactiae* among the heifers. Other specific pathogens (streptococci, corynebacteria, and coliform bacteria) were also absent from the milk, and, therefore, the primary agent of infection in these cases remained in doubt.

Mastitis control by vaccination, C. R. CORSON (*Vet. Med., 40 (1945), No. 1, p. 24*).—The author reports an experiment in mastitis control through immunization undertaken in 20 dairy herds comprising 368 cows. Ten herds, including 181 cows, were vaccinated with mixed bacterins, and 10 herds, comprising 187 cows, were given lactovaccine. Over a period of several years prior to the beginning of the experiment the number of cases of acute and chronic mastitis in these 20 herds had averaged 8 cases per herd per year. During the 6-yr. period of the experiment no new cases of acute mastitis developed in the 10 herds given lactovaccine, except in new cows added to the herds, but 10 cases of chronic mastitis were found. In the 10 herds treated prophylactically with mixed bacterins, an average of 4 cases per herd per year occurred, some of them acute.

Water as a vehicle for the infusion of sulfanilamide in the treatment of mastitis, C. B. KNODT and W. E. PETERSEN. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 811, pp. 212–214, illus. 2*).—Although based on only a limited number of acute and chronic cases of mastitis, a method is presented which uses water as the vehicle for the infusion of sulfanilamide into the bovine mammary gland. As much as 60 gm. of sulfanilamide, shaken with 600 cc. of distilled water, was injected into completely milked quarters with promising results.

Treatment of necrophorus infections of cattle with sulfapyridine, H. S. KINGMAN and W. M. STANSBURY (*North Amer. Vet., 25 (1944), No. 11, pp. 671–674*).—This report records clinical experiences with sulfapyridine in the treatment of necrotic laryngitis and interdigital phlegmon in cattle.

Bovine trichomoniasis, B. B. MORGAN (*Minneapolis 15: Burgess Pub. Co., 1944, pp. 150+, illus. 7*).—One purpose of this monograph is primarily to assemble in convenient form all available information related to bovine trichomoniasis and secondarily to stimulate research workers in related fields. The several chapters deal with the morphology and life cycle, isolation, cultivation, symptoms and lesions, diagnosis, serology, immunity, H-ion concentration, animal experimentation, prevention and control, and miscellaneous. A bibliography of 408 titles and a parasite-host list of 91 *Trichomonas* are included.

The intradermal test in bovine trichomoniasis, W. R. KERR (*Vet. Rec., 56 (1944), No. 34, pp. 303–307*).—Some applications of this test are described, and its limitations are discussed.

An outbreak of bovine tuberculosis due to udder irrigation, D. MCFARLANE, J. S. GARSIDE, P. S. WATTS, and J. T. STAMP (*Vet. Rec., 56 (1944), No. 41, pp. 369–371*).—An outbreak of tuberculosis in an attested herd suggested that the high incidence had resulted primarily from irrigation of the udders with apparatus contaminated with *Mycobacterium tuberculosis.* Investigation revealed that irrigation was responsible for the introduction of tubercle bacilli and subsequent development of tuberculous mastitis in each of the 7 irrigated quarters of 6 cows in a single herd. Fourteen additional quarters in the same herd, irrigated with the same apparatus and on the same day, developed a clinical condition similar to and probably identical with those examined. Every animal in contact with those irrigated developed tuberculosis, as shown by the tuberculin test. Thirteen of 14 calves fed on bulked milk from this herd developed a positive tuberculin reaction. Three yearlings, running with the cows when dry gave positive tuberculin reactions, probably from sucking the irrigated udders. The ease of infection of the bovine mammary gland with *M. tuberculosis* is pointed out, and the great danger of mammary tuberculosis to the "in contacts" is emphasized, as well as the frequent impossibility of clinical diagnosis of tuberculosis of the bovine mammary gland and the necessity for taking adequate precautions when irrigating udders.

A consideration of some of the factors concerned in intracutaneous injection of cattle, W. M. HENDERSON (*Jour. Pathol. and Bact., 56 (1944), No. 3, pp. 315–325, illus. 6*).—The pressure required for the intracutaneous injection of cattle is affected by the choice of site and by the volume and viscosity of the inoculum. The pressure required for the injection of 5 cc. of a watery inoculum into the skin of the neck of cattle may be as great as 30 lb. per square inch. This pressure has to be increased for the injection of more viscous liquids. A description is given of the design and use of a syringe which enables an intracutaneous injection of up to 10 cc. of liquid to be made at a single site. Details are given of experiments which demonstrate the rapid absorption by the lymphatics of material injected intracutaneously. A comparison is made of the rate of lymphatic absorption after subcutaneous injection. The opinion is expressed that, because of the more exacting technic required, the production of immunity by intracutaneous injection is not advisable unless this route is proved to give better results than the subcutaneous or intramuscular.

A case of choline poisoning in cattle, A. BONDI and H. MEYER (*Nature [London], 154 (1944), No. 3913, pp. 551–552*).—Pathological symptoms observed in cattle at Kiriat Anavim, Palestine, in which after the first calving the uterus did not contract but remained open and atonic for a considerable time, were attributed in the absence of other observable causes to the feeding of wet brewers' grains. Analyses of this material yielded 0.25–0.28 percent free choline (calculated as dry matter). Normal barley contained no free choline, and it is concluded that "free choline can act as a poisoning agent when fed over long periods of time."

Mushroom poisoning in cattle, P. L. PIERCY, G. HARGIS, and C. A. BROWN. (La. State Univ.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 811, pp. 206–*

208).—Following the death of several cattle from suspected poisoning on range pastures, investigation revealed that an extremely dry and warm summer followed by heavy drenching rains in mid-September had made conditions ideal for mushroom growth and that certain wooded areas had become literally white with mushrooms, including an unusually large number of the destroying angel (*Amanita verna*). Experimental feeding with this fungus revealed that neither a calf nor a rabbit ate the mushrooms voluntarily, but cattle in the areas ceased to be affected when the mushrooms practically disappeared. It is believed that in view of the infrequence of the prevailing conditions, the danger of poisoning by mushrooms is minimal, particularly if range cattle are maintained on ample and nutritious forage.

Sugar beet poisoning in cattle, F. CHAMBERS (*Vet. Rec., 56 (1944), No. 16, p. 128*).—Three outbreaks ascribed to the feeding of whole beets are described.

The control of diarrhea ("white scours") of new-born dairy calves by means of serum and sulfaguanidine, G. H. WISE and G. W. ANDERSON. (S. C. Expt. Sta.). (*Jour. Dairy Sci., 27 (1944), No. 11, pp. 965–979, illus. 1*).—An acute infectious and contagious diarrhea (white scours) of newborn dairy calves was investigated clinically.

Scrupulous sanitation of the surroundings and adequate nutrition of the calf during the immediate postnatal period are regarded as fundamental in the control of scours of newborn calves, but such measures alone were not found adequate to control the disease under general herd conditions. No recognizable reduction in the incidence of scours resulted from either giving cod-liver oil as a dietary supplement or injecting a commercial antiscour serum as a prophylactic measure.

In further studies with sulfaguanidine (E. S. R., 87, p. 854), it was found to be effective prophylactically and therapeutically when given in proper doses.

"As a prophylactic agent, it is recommended that sulfaguanidine in doses of approximately 2 gm. be given to the calf at the following intervals: First dose, shortly after first colostrum consumption, which should not be later than 2 hr. after birth; second dose, 6 to 8 hr. later; subsequent doses, morning and night through the second or third day. Doses may be reduced to 1 gm. after the first 36 hr.

"The following amounts of sulfaguanidine, per 100 lb. body weight of calf, given at 4- to 6-hr. intervals are recommended as a guide for treatment: First dose, 7 gm.; second dose, 5 gm.; third and subsequent doses, 4 gm. These doses should be varied according to the condition and response of the calf. During the first 24 hr. after the first clinical symptoms of scours are manifested, all feed should be withheld from the calf and liberal amounts of warm water should be given. Discontinue the sulfaguanidine therapy as soon as scours subsides.

"In view of the dangers from complications associated with diarrhea of the newborn calf, prophylactic measures should be given precedence over therapeutic control except in herds where only sporadic cases occur."

A list of 37 references is appended.

Vaxartad muskeldegeneration (s. k. fiskkött) hos kalv [Waxy muscular degeneration (so-called "fish flesh") in calves], K. LILLEENGEN (*Svensk Vet. Tidskr., 49 (1944), No. 8, pp. 231–289, illus. 4; Eng. abs., pp. 284–288*).—The etiology and pathogenesis of this disease are discussed on the basis of studies with newborn calves fed on milk in which the greater part of the A, B_1, and C vitamins had been destroyed by long-continued heating and oxidation. These experiments have indicated that the source of the disease is not to be sought for in infections or traumatic causes, but is more probably ascribable to C or B_1 hypovitaminosis or to a combination of these factors.

Blindness with papilledema in calves, E. L. STUBBS (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 811, pp. 209–211*).—A number of cases are cited in a single herd which were diagnosed as typical of choked disk or papilledema. Although available information does not show that such blind animals give birth to similarly affected animals, their use for breeding purposes is deprecated and the use of the best possible feeding methods recommended to prevent the development of blind calves.

Listerellosis occurring in Wisconsin, G. R. Spencer, H. H. Hoyt, and C. K. Whitehair. (Wis. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc., 105 (1944), No. 811, pp. 195–197, illus. 4*).—Outbreaks of listerellosis in three Wisconsin flocks of sheep are described. The symptoms, post-mortem gross and microscopic tissue changes, and bacteriologic findings are reported.

Ulcerative stomatitis in sheep, A. M. McDonald (*Vet. Rec., 56 (1944), No. 36, pp. 324–325*).—Infections in two flocks of ewes and lambs are described, together with an apparently satisfactory response to sulphonamide therapy.

Control of blowfly on Merino sheep: Classification of types as a measure in breeding less susceptible sheep, A. H. de Vries and J. C. de Klerk (*Farming in So. Africa, 19 (1944), No. 221, pp. 485–495, illus. 14*).—Continuing the series (E. S. R., 90, p. 81), a detailed description is given of three types of sheep, classified as to skin development in the crutch, as a measure in breeding sheep less susceptible to blowfly attack.

Nicotine poisoning in lambs, H. A. Crawshaw (*Vet. Rec., 56 (1944), No. 31, pp. 276–277*).—The death of eighteen 3-month-old lambs, with an average weight of 37.2 lb., as a result of overdosing with a nicotine sulfate, copper sulfate solution is recorded. Ante-mortem symptoms and post-mortem findings are described, and it is concluded that the toxic dose of nicotine sulfate for lambs of this class lies between 3.2 and 4.8 gr., which is approximately equivalent to from 0.64 to 0.96 gr. of nicotine. A report is recorded that 16–gr. doses of nicotine sulfate (3.2 gr. of nicotine) was the dose required to produce toxic symptoms in bulls and heifers of from 1 yr. to 18 mo. of age.

Diagnostic tests including hemotology in swine brucellosis and capsule formation in Brucella, C. M. Cotton (*Md. Univ. Off. Pub., 41 (1944), No. 6, pp. 9–10*).—A study of capsules in 38 strains of *Brucella* showed all organisms to be encapsulated, but there were definite differences in rough, smooth, and intermediate strains when stained with India ink-crystal violet capsular stain, and the microscopic method of identifying these strains appeared to be easier and less costly than the usual plating technic.

Studies of 1,228 blood samples from healthy, infected, and vaccinated swine indicated that mild anemia and an elevation of the leucocyte count were characteristics of the disease, but that neither was a dependable index of infection. Active lymphocytosis was the most striking feature of the blood picture. The opsonocytophagic test, adapted for use in swine, proved helpful in detecting the stage of the disease.

Malignant oedema in swine: Probably due to Clostridium septicum, J. S. Steward (*Vet. Rec., 56 (1944), No. 36, pp. 321–323*).—Malignant edema in swine probably due to *C. septicum* is recorded, apparently for the first time, in Great Britain. What is considered a characteristic clinical picture was observed in nine animals. Swine fever virus infection in the herd appeared to increase susceptibility to the organism; infection in such cases appeared to be via the alimentary tract. Infection in nonvirus-infected herds appeared to follow inoculations or wounds.

Cryptococcus infections in Equidae, S. C. J. Bennett (*Jour. Roy. Army Vet. Corps, 16 (1944), No. 1, pp. 108–118*).—This is a discussion based on 18 yr. of clinical and laboratory experience in the Sudan. It is held that the term "epizootic lymphangitis" should be discarded in favor of the more general term "cryptococcus infection," and that all cryptococci causing suppurative infections in Equidae should continue to be regarded as *C. farciminosus*. In diagnosis, "less attention should be paid to clinical signs and more to the microscopic examination of pus."

Biochemistry in the diagnosis of the diseases of small animals, C. E. HAYDEN (*Cornell Vet., 33 (1943), No. 1, pp. 85–103; also in N. Y. State Vet. Col. Rpt., 1942–43, pp. 63–77*).—This review deals largely with the results of blood studies with dogs and cats. A compilation of data on the composition of dog blood and its significance in pathological conditions is included.

Hematological aids for diagnosis in the dog and cat, L. N. ATKINSON (*North Amer. Vet., 25 (1944), No. 11, pp. 675–679*).—Case histories are presented, with interpretations, as a basis for a discussion of hematological aids which have been found useful in routine practice. It is not thought possible to use the blood count as the sole diagnostic procedure, and hematological work is described as very time consuming.

Fifth annual report of the Regional Poultry Research Laboratory, East Lansing, Michigan, July 1, 1943, to June 30, 1944 (*U. S. Dept. Agr., Bur. Anim. Indus., [1944], pp. 27+, illus. 6*).—A summary is given of the progress of research at the laboratory and cooperating State agricultural experiment stations. This research has been limited primarily to studies related directly or indirectly to the lymphomatosis problem.

The results obtained in breeding over a period of years indicate that resistance to lymphomatosis has been increased in certain lines over that in other lines. Experimental evidence has been obtained to show that transmission of lymphomatosis may occur when healthy birds are brooded and raised in pen contact with infected birds, and that the hatching egg has been incriminated as a possible means of transmitting this disease. Related strains of the causative agent may be used advantageously in studying qualities such as transmission, viability of the agent, and immunology, with the expectation that this information may be applied to studies of lymphomatosis.

The incidence of lymphomatosis among females was greater than among males of the same families. Gonadectomy resulted in an increase in the incidence of the disease. The use of certain sex hormones reduced the incidence of lymphomatosis among the chickens on tests.

There was no correlation between the incidence of lymphomatosis when induced by inoculation and the occurrence of the disease under natural conditions.

Causes of mortality in four successive flocks of broilers at the substation, K. C. SEEGER and A. E. TOMHAVE (*Delaware Sta. Bul. 249 (1944), pp. 23, illus. 2*).—In this study 5,965 birds at the Georgetown Substation were subjected to post-mortem examination from a total of 37,261 chicks started. The average mortality for the 4 commercial-sized experimental flocks was 16 percent (lowest 4.8 and highest 27.9 percent). The periods of highest mortality were the first week and the fifth through the ninth weeks. Coccidiosis, bronchitis, omphalitis, and vitamin A deficiency were the 4 leading causes of death, and collectively were responsible for 75 percent of the mortality. The remaining 25 percent mortality was due to 24 causes, some of which are potentially serious diseases. Pathological changes were found in all but 0.14 percent of the cases by visible means only.

Aspergillosis in fowls, R. P. ASTHANA (*Indian Acad. Sci. Proc., 20 (1944), No. 2, Sect. B, pp. 43–47, illus. 1*).—A serious outbreak encountered in the Central Provinces of India during 1943 is described. *Aspergillus fumigatus* has been isolated from the heart and cutaneous blood, lungs, and other organs of sick birds, eggs, and poultry feed. Mortality was highest in young fowls. Eggs from sick birds hardly ever hatched. White Leghorns were the most resistant of the breeds available.

An electrophoretic study of serum and plasma from normal and leucosis-affected chickens, E. SANDERS, I. F. HUDDLESON, and P. J. SCHAIBLE. (Mich. Expt. Sta. coop. U. S. D. A.). (*Jour. Biol. Chem., 155 (1944), No. 2, pp. 469–481,* *illus. 13*).—A comparative electrophoretic analysis by the moving boundary method was made of the proteins in serum and plasma from normal chickens and from chickens affected with avian leucosis. White Leghorns from 15 to 18 weeks of age were used. A new component, designated the L component, was found in serums from chickens affected with the several forms of leucosis. Although there were no significant differences found in the electrophoretic patterns of serums that would distinguish one type of leucosis from another, it is thought that the presence of the L component in the serum from leucosis-affected chickens may have immunological and diagnostic significance.

The prophylactic effect of sulfadiazine and sulfaguanidine against mosquito-borne Plasmodium gallinaceum infection in the domestic fowl (preliminary report), G. R. COATNEY and W. C. COOPER (*Pub. Health Rpts.* [*U. S.*], *59* (*1944*), *No. 45, pp. 1455–1458*).—Sulfadiazine was given to two series of chicks at a dosage of 1.0 mg. per gram twice daily for 8 days and to one series at a dosage of 0.5 mg. per gram for 4 days, beginning just prior to bites by *Aedes aegypti* mosquitoes infected with *P. gallinaceum.* None of the treated birds developed malaria. When sulfaguanidine was given according to the same plan, 2 of 20 birds receiving the higher dosage and 5 of 12 birds receiving the lower dosage became infected. Of the 34 control birds, 27 developed typical infections. "These data lead us to believe that sulfadiazine has decided prophylactic action against mosquito-borne *P. gallinaceum* infection in the chick; sulfaguanidine at the same oral dosage is considerably less effective."

Possible role of potassium in pullet disease, H. M. SCOTT, E. JUNGHERR, and L. D. MATTERSON. ([Conn.] Storrs Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, *57* (*1944*), *No. 1, pp. 7–10, illus. 2*).—Laboratory records for 1940–43 showed that so-called pullet disease ranked second in pathologic importance among Connecticut poultry diseases, with an average incidence of 22.7 percent and a rate during 1943 of 34.5 percent in 269 lots. In two-thirds of the cases it was characterized by kidney damage similar to visceral gout. A repetition and extension of the work of Correll (E. S. R., 86, p. 79) showed that the "salt effect" resulting from feeding sodium citrate to chicks corresponded to experimental visceral gout, and the protective action of potassium salts against the salt effect was confirmed and shown to hold for simple compounds like potassium chloride or a good agricultural grade of muriate of potash at levels of 1 to 2 percent in the feed. Molasses, due to its potassium content, was found to be protective, which rationalizes the corresponding empirical treatment for pullet disease. In a small-scale experiment on spontaneous pullet disease cases, potassium chloride seemed helpful, which suggests its use during molasses shortage.

Blackhead in turkeys: Notes on its occurrence and its transmission, C. F. SCHLOTTHAUER, F. C. MANN, and H. E. ESSEX (*North Amer. Vet.*, *25* (*1944*), *No. 10, pp. 603–608*).—Following a review of the literature, investigations carried on since 1929 are summarized, including six experiments on transmission of blackhead. These experiments indicated that the causative protozoan organism of blackhead can exist in soil and that it is readily transmitted to susceptible turkeys by contact exposure. The organism was found to be viable after the soil had been pulverized and dried for 15 days at room temperature. Attempts to transmit the disease by confining turkeys with adult chickens in cages having metal or wood floors covered with peat moss or when turkeys were confined in a cage with wire mesh screen floor were unsuccessful. Infection occurred when turkeys were fed from an open feed hopper located in an infected poultry house containing adult chickens. Turkeys having surgically occluded ceca were more resistant to blackhead, but when permitted to range on heavily infected premises losses as great as 33 percent were observed during a single outbreak. It is concluded that turkeys may be raised successfully on infected premises by placing them in an inclosure the floor of which is raised off the ground so that contact with, or soiling of, the ground is prevented.

Erysipelas in turkeys in New York State, E. L. BRUNETT and M. S. HOFSTAD (*Cornell Vet., 33 (1943), No. 1, pp. 105–107; also in N. Y. State Vet. Col. Rpt., 1942–43, pp. 146–147*).—Five outbreaks in New York State are briefly described.

The use of the agglutination test in detecting Salmonella typhimurium carriers in turkey flocks, W. R. HINSHAW and E. MCNEIL. (Univ. Calif.). (*U. S. Livestock Sanit. Assoc. Rpt., 47 (1943), pp. 106–121*).—This paper reports studies on the utilization of the existing knowledge of the antigenic structure of the Salmonellas in an attempt to eradicate *S. typhimurium* from turkey flocks. Results on 151,626 agglutination tests made over a 3-yr. period for four groups of turkey growers are reported. The studies show the necessity of using, as separate tests on each blood sample, two types of antigens at 1–25 as a finding dilution. These are (1) an H or flagellar type and (2) an O or somatic type.

The use of two supplementary specific antigens, one containing the component "i" (*S. kentucky*) in common, and one containing the components 1, 2, 3 (*S. newport*) in common, is found to be a valuable aid in interpretatoin of the H type reactions.

A study of the bacteriological results on reactors autopsied revealed the following percentages of isolations of *S. typhimurium* from various organs: Intestines 80.9, liver 66.7, spleen 66.7, and reproductive organs 16.7.

"Because of the ubiquitous distribution of *S. typhimurium* in animals other than turkeys, it is doubtful if it can be eliminated by testing alone. The results obtained show, however, that the tests described have possibilities as aids in eradicating salmonellosis from a community." The limitations as well as the possibilities of their use are discussed.

Avian salmonellosis: Types of Salmonella isolated and their relation to public health, W. R. HINSHAW, E. MCNEIL, and T. J. TAYLOR. (Univ. Calif.). (*Amer. Jour. Hyg., 40 (1944), No. 3, pp. 264–278*).—During the period 1935–1943, 561 cultures of 23 different antigenic types were isolated from 353 outbreaks in avian species, mainly turkeys in California. This paper gives an account of each type of *Salmonella* studied, with special emphasis on the public health aspect.

S. typhimurium accounted for 60 percent of 291 outbreaks in turkeys and for 35 percent of 43 outbreaks in chickens. *S. bareilly* caused 42 percent of the outbreaks in chickens but only 5 per cent of those in turkeys. Multiple infections were found to exist on the same ranch. On each of two ranches, 6 different types accounted for losses in the period covered by the survey.

AGRICULTURAL ENGINEERING

Domestic fuel possibilities of Maine peat, J. M. TREFETHEN and R. B. BRADFORD (*Maine [Univ.] Technol. Expt. Sta. Paper 46 (1944), pp. 47+, illus. 24*).—This paper is in two parts, of which the first deals with the topics: Present outlook for fuel peat in Maine; nature and occurrence of peat; locations and characteristics of some Maine peat bogs; and quality of Maine peat from selected bogs. From this part of the study it is concluded that in percentage of ash, of substances volatile on ignition, and of fixed carbon as well as in B. t. u. heat value, the heat value of these peats is comparable to that of wood, with which it must compete in this region. There are numerous deposits with sufficient colloidal matter for the manufacture of suitable machine peat fuel, though some deposits are too fibrous in nature to produce a dense fuel.

The second part of the paper, on the operation of fuel peat bogs, takes up machine peat; the machine peat process; selection of the bog; drainage of the bog; capacity of proposed operation; excavating; pulping, or maceration; drying macerated peat; and harvesting. It is here pointed out that a considerable volume of peat is present in Maine, approximating some 150 million tons. Much of this peat is of the fibrous variety, not adapted to the most economical manufacture of machine peat fuel, but there are some deposits of peat, sufficiently decayed and with high colloidal content, that are so adapted. A market for machine peat fuel, if the price can be kept sufficiently low, is recognized. In view of labor conditions and fuel shortages anticipated to continue through the winter of 1944–45 serious consideration of the development of fuel peat is found to be warranted.

AGRICULTURAL ECONOMICS

Agricultural economic reports and publications (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 52+, illus. 2*).—The work of the Bureau of Agricultural Economics and its organization are described. The periodicals and scheduled reports, with release dates, and the reports and publications by subjects are listed.

[Papers on agricultural economics] (*Jour. Land and Pub. Util. Econ., 20 (1944), No. 3, pp. 194–201, 217–222*).—Included are the following papers: Land Tenure in Brazil, by T. L. Smith (pp. 194–201) (La. State Univ.); and The German TVA, by W. F. Brook (pp. 217–222). The latter is a description of the creation and work of the Rhine Ruhr Authority.

[Investigations in agricultural economics by the North Dakota Station] (*North Dakota Sta. Bimo. Bul., 7 (1944), No. 1, pp. 10–13, 18–25, illus. 2*).—The study of land market activities (pp. 10–12) (coop. U. S. D. A.) is extended through the second quarter of 1944, and tables of farm prices (pp. 12–13) (E. S. R., 92, p. 125) are continued through August 15, 1944. An article, School District Costs in Western North Dakota, by M. H. Taylor (pp. 18–25), discusses the operation of districts, number and enrollment of schools, variations in taxable wealth and tax rates, receipts, expenditures, and indebtedness of the districts, and makes suggestions for reorganization.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Bul. 231 (1944), pp. 274–276, 277*).—An article by C. W. Hauck analyzes the cost of producing apples in 1943 as reported by 136 growers with 6,114 acres of bearing trees. The table of index numbers of production, prices, and income by J. I. Falconer is brought down through August 1944.

The Agricultural Situation, [November 1944] (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Situation, 28 (1944), No. 11, pp. 31, illus. 3*).—This annual outlook issue includes brief summaries on different economic conditions and commodities prepared by staff members of the Bureau of Agricultural Economics, and is based chiefly upon the materials used at the Twenty-second Annual Outlook Conference held in Washington, November 13–18, 1944.

1945 Agricultural outlook charts (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 100+, illus. 103*).—"The charts in this book have been selected as those most likely to be of use to extension workers in presenting the basic facts regarding the major crop and livestock industries and the food situation. They are intended as a supplement to the mimeographed reports on the farm outlook for 1945."

The impact of the war on the financial structure of agriculture, A. S. Tostlebe, D. C. Horton, R. J. Burroughs, H. C. Larsen, L. A. Jones, A. R. Johnson, et al. (*U. S. Dept. Agr., Bur. Agr. Econ., 1944, pp. 191+, illus. 35*).—Part 1, Changes in the Financial Structure of Agriculture, 1940–44, discusses the balance sheet, the income statement, and the changes in the real estate, non-real estate physical inventories, intangibles, farm real estate and non-real estate debt, proprietary equities, and economic forces of World War II compared with World War I. Part 2, Financial Structure of Agriculture in the Post-war Period, discusses the immediate and later post-war developments affecting the financial structure.

Farmers in the war (*Washington: [U. S.] Off. Price Admin., 1944, pp. 76+, illus. 63*).—Tables and charts compare the prices of commodities sold and purchased by farmers during Wars I and II, prices of farm products and industrial goods, farm operating income, savings, farm prices after War I, and similar material.

Useful records for family farms, S. W. MENDUM (*U. S. Dept. Agr., Farmers' Bul. 1962 (1944), pp. 29+*).—Why records should be kept and the kinds of records needed are described. Records of property or inventory; receipts and expenses; production, performance, and incidental matters; household accounts; and the summarization of results and depreciation details are discussed. This supersedes Farmers' Bulletins 511, 572, and 1182 (E. S. R., 28, p. 191; 30, p. 793; 44, p. 593).

Relation of total income on farms to price index, F. B. HEADLEY and M. L. HARTLEY (*Farm Mangt. Bul. [Nevada Sta.], 5 (1944), No. 1, pp. 7+, illus. 3*).—The abstract (E. S. R., 91, p. 758) should read as follows: "The following relations, indicated by regression equations, were found for the period 1929–43 between (A) gross farm income of four cooperating Nevada farmers with the Nevada farm price index, $y = -29.4 + 1.02x$; (B) U. S. D. A. Bureau of Agricultural Economics gross farm income for Nevada with the Nevada farm price index, $y = -27.7 + 1.07x$ and (C) U. S. gross farm income index with the U. S. farm price index, $y = -34.5 + 1.29x$."

Getting started in farming, M. R. COOPER (*U. S. Dept. Agr., Farmers' Bul. 1961 (1944), pp. 33+, illus. 16*).—A bulletin for persons knowing little or nothing about farming and those with farming experience but desirous of changing location. It gives information to assist in selecting a location, selecting a farm, and getting started in farming. It supersedes Farmers' Bulletin 1088 (E. S. R., 43, p. 291).

The Cumberland Plateau in Tennessee, F. N. MASTERS and C. E. ALLRED (*Tennessee Sta. Bul. 192 (1944), pp. 32, illus. 17*).—This bulletin, planned for prospective settlers, includes information as to physical features, soils, climate, industries, transportation, markets, taxes, credit facilities, agriculture, population, etc. A list of 55 literature citations is included.

Labor, materials, and cost of clearing land on Cumberland Plateau, H. J. BONSER, C. E. ALLRED, and C. C. MANTLE (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 177 (1944), pp. 39+, illus. 31*).—Information from 97 tracts handled in different ways showed the following averages on an acre basis: Estimated value of products, $36.81; cost of clearing, $24.41; and labor requirements to the stump stage, 123.1 hr. plus 2.6 mule hours. The average hours required for different operations were: Girdling, 11; felling, 47.2; brush removal, 48.9; destroying tops, 16.6; pulling stumps, 40.9; and destroying stumps, 9.0.

Former use of land now in Douglas Reservoir, H. J. BONSER (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 176 (1944), pp. 39+, illus. 11*).—Using A. A. A. compliance records for 421 farms embracing 92 percent of the lands lying wholly or partially in the reservoir, the 1939 use of lands below pool level and the land remaining of tracts directly affected are described.

Combinations of enterprises on plantations in the lower Arkansas River Delta, J. W. WHITE. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 449 (1944), pp. 75, illus. 5*).—The study is based on a survey made in 1930 of 38 plantations, a follow-up survey in 1941 of 20 of the same plantations, and data on crop and livestock enterprises for a random sample of 443 Delta farms in Jefferson County obtained by the A. A. A. and the Arkansas Agricultural Extension Service. The changes in the enterprises from 1929 to 1940, the production requirements, yields, prices, etc., are discussed. Using the findings as to production requirements, yields, costs, prices, etc., budgets of estimated costs, monthly labor requirements, and returns to operators and sharecroppers are set up for an approximate 1,125-acre plantation with approximately 794 acres of cropland, 221 acres of woodland pasture, 68 acres of wasteland, and 41 acres of farmstead, roads, and ditches. The budgets cover three types of organization built around cotton as the principal source of income (285 acres) and the following supplementary sources: (1) Production of feeder calves and feed crops, (2) soybeans and feed crops, and (3) soybeans, feed crops, and sufficient beef cattle to utilize noncrop lands and pastures. The returns are computed on the basis of assumed relative prices and 1942 prices.

From 1929 to 1940 the cotton acreage per 100 acres of cropland was reduced approximately 50 percent. The chief increases in other crops were: Lespedeza 12 acres, and corn and small grains 6.5 acres, per 100 acres of cropland. Work stock decreased slightly and all other livestock, especially beef cattle, increased. With assumed relative prices the estimated net returns per family for operator and per sharecropper were: With feeder calves and feed crops, —$2,593 and $244; soybeans and feed crops, $1,932 and $230; and soybeans, feed crops, and beef cattle to utilize pastures, $1,617 and $234.

Returns from poultry farming in Massachusetts in 1943, C. R. Creek. (Coop. U. S. D. A.). (*Massachusetts Sta., 1944, FM-17, pp. 27+, illus. 4*).—Analysis is made of 24 poultry account books distributed by the Extension Service including analysis of farm business and analysis by size and type of business. Flock maintenance is discussed and comparison made of the farm returns, 1939–43.

How some poultrymen made a profit in 1943, C. R. Creek (*Massachusetts Sta., 1944, FM-18, pp. 14*).—The operations, expenses, returns, etc., of several farms are described.

Efficiency as applied to cotton ginning business, W. E. Paulson (*Texas Sta. Bul. 654 (1944), pp. 39, illus. 11*).—Efficiency as discussed in this bulletin is confined to the ginning business in Texas. Cost as a measure of efficiency; standards of ginning business—gin income, cost of ginning, and volume of business (E. S. R., 87, p. 132); the profit experiences of different groups of gins; the standard costs of 1927–28 and 1937–38; profit as an index of business efficiency; size of crop, number of gins, and returns on investment; variations in ginning costs from standard costs; volume of ginning and efficient use of capital, etc., are discussed. Charts show the effect of volumes of ginnings greater and less than standard volume; relation between fixed and variable cost per bale and total cost to volume of ginning; relations among size of crop, number of operating gins, and average profit on gin investment; relations among volume of ginning, gin income per bale, and number of years required to finance a plant from profits; relation of volume ginned to cost per bale as influenced by cost efficiencies; influence of volume of ginning on investment, capital requirement, and profits per bale; and relation of cost per bale and returns on gin investment to cost of ginning, gin income, and volume of ginning. Equations for estimating total standard costs and items of costs for different areas of the State are given in the appendixes.

Marketing South Carolina sweetpotatoes, W. T. Ferrier (*South Carolina Sta. Bul. 352 (1944), pp. 30, illus. 2*).—Information is assembled from Federal, State, and private sources, from questionnaires on consumers' preferences, marketing practices, and problems circulated by the Southeastern Chain Store Council and the author; and on production and marketing practices through interviews with growers, former members of the South Carolina Sweetpotato Growers Association, the Extension Service, and the experiment station staff. The production possibilities for food, feed, and industrial uses, the varieties and supply areas, factors affecting production and marketability, consumers' preferences, and methods of improving marketability are discussed.

Peach marketing practices in the Nashville-Highland district of Arkansas in 1940, J. W. White and O. T. Osgood (*Arkansas Sta. Bul. 452 (1944), pp. 32, *illus. 3*).—Data for the 1940 season on production, yields, grades, market defects and their causes, preparation for market, sales, marketing methods and practices, truck transportation, and factors associated with prices, collected from 63 farms and regarding 100 truckloads of peaches, are analyzed and discussed.

Butterfat differentials used in paying producers for market milk, L. SPENCER and S. JOHNSON. (Cornell Univ.). (*Amer. Milk Rev., 6 (1944), No. 10, pp. 302–308*).—The differentials used in various large markets of the United States are discussed.

An inventory of farmers' cooperatives operating in Pennsylvania in 1943, J. K. STERN (*Pennsylvania Sta., Jour. Ser. Paper 1254 (1944), pp. 41+, illus. 21*).—The early history and development of cooperatives in the State, the cooperatives for marketing different kinds of commodities, purchasing cooperatives, and the Pennsylvania Association of Cooperative Organizations are described with data as to the location, business, etc.

Cooperative purchasing of seed in relation to crop production, T. E. HALL (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 74 (1944), pp. 36+, illus. 13*).—The development, present status, and operations of local and regional cooperatives for the purchase of seed are discussed.

Delivery conservation practices of cooperative oil associations affiliated with the Farmers Union Central Exchange, J. W. MATHER (*U. S. Dept. Agr., Farm Credit Admin., Misc. Rpt. 77 (1944), pp. 39+, illus. 3*).—A study was made in the summer of 1943 of 21 representative local cooperative oil associations, located in 5 States and associated with the Farmers Union Central Exchange, St. Paul, Minn., by personal visits and mail. The performance records of trucks and the factors affecting delivery conservation and efficiency are analyzed, and the aids in developing delivery efficiency are discussed. Suggested delivery efficiency record forms are included.

Delivery records (31 trucks) showed the gallons delivered per mile driven ranged from 5.9 to 20.6. Operating costs (6 trucks) averaged 0.5 ct. per gallon and 5 ct. per mile. Total delivery costs ranged from 1 to 1.5 ct. per gallon and 12 to 15 ct. per mile. Records for a limited number of tank trucks showed a 25 percent improvement during the war in terms of gallons delivered per mile driven, the increase being as high as 50 percent in two cases. Trucks with over 600-gal. tanks delivered about 12.5 percent more gasoline per mile than those with 600-gal. tanks. Redistribution of barrels to farmers, increase of time on "on order" deliveries, standing orders, larger deliveries, lengthening intervals between regular deliveries on scheduled routes, discontinuance of special deliveries, solicitation of business, and collections with the trucks were methods found important in increasing delivery efficiency.

Foreign Agriculture, [December 1944] (*U. S. Dept. Agr., Foreign Agr., 8 (1944), No. 12, pp. 269–284*).—An article, New Zealand's Agricultural-Marketing Policies, by M. Wright (pp. 270–281), describes the farm resources, production, markets, the activities of export-control boards, the Empire relations and agricultural policy, guaranteed prices, internal marketing control of different products, the bulk-purchase agreements, and considerations affecting future policy. The United Kingdom Wartime Policy and Post-war Program for Milk is described by D. D. Jones (pp. 282–284).

International trade increases demand for farm products (*U. S. Dept. Agr., 1944, AIS-1, pp. 16, illus. 10*).—A popular discussion of the need of imports, effect of foreign trade on living level, effect of depression and self-sufficiency on international trade, how farmers gain from export of industrial products, lend-lease, effects of tariffs, trade agreements, and post-war planning for world trade and peace.

Crops and Markets, [July and October 1944] (*U. S. Dept. Agr., Crops and Markets, 21 (1944), Nos. 3, pp. 113–156, illus. 2; 4, pp. 157–192, illus. 2*).—Included in both publications are tables and charts of the usual types on yields and production of different crops, stock of grains on farms, farm employment and wage rates, hog-corn ratios, prices received and paid by farmers, and market reports for cotton, dairy and poultry products, feed, grains, livestock, and livestock products. No. 4 also includes data on sales and use of fertilizers for cotton and on egg, wool, and milk production.

Farm production, farm disposition, and value of hay, 1909–41, by States, C. G. CARPENTER ET AL. (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1944, September, pp. 50+, illus. 1*).—Tables show by year for the United States and the several States the production of tame and wild hay, the disposition, the season average price per ton, and the value of production and sales.

Cotton acreage, yield, and production, 1942 and 1943, by counties (*U. S. Dept. Agr., Bur. Agr. Econ., Crop Rptg. Bd., 1944, pp. 29+*).

Use of machinery and horses on Maine farms keeping dairy cows, G. F. Dow (*Maine Sta. Bul. 429 (1944), pp. 41–79+, illus. 3*).—The greater part of the data was obtained in a study of about 500 farms in five general dairying areas of the State in the summer of 1943. Other information was drawn from previous studies and the 1940 Census. The number of farms having different kinds of equipment, the age of the equipment, and the needs for new equipment; the use and costs of operating automobiles, trucks, tractors, and of keeping and using horses; the use of electricity; the investment in machinery; the comparative efficiency of different kinds of tractive power; the methods of handling hay; and the effects of use of milking machines, barn equipment, etc., on costs and labor requirements are analyzed and discussed.

Maryland farm statistics, C. E. BURKHEAD, D. B. WILSON, and A. B. HAMILTON. (Coop. U. S. D. A.). (*Maryland Sta. Bul. X3 (1944), pp. 110+, illus. 7*).—Statistics from the earliest dates available are included on acreages (or numbers), production, monthly prices, and value of different crops and kinds of livestock, real estate, incomes, wage rates, etc., and also on planting and harvesting seasons, and distribution of acreages of crops, livestock, and poultry by counties.

RURAL SOCIOLOGY

The urban status of rural migrants, H. W. BEERS and C. HEFLIN. (Univ. Ky.). (*Social Forces, 23 (1944), No. 1, pp. 32–37*).—The authors found that rural migrants in Lexington, Ky., constitute large proportions of the population at each economic level, although their representation is greatest at the lowest level. With education and income somewhat below that of their urban-reared neighbors, they report general approval of their community and especially of its institutions. They report a decrease in some forms of social participation, they are completely convinced that high school education is important, and they appreciate the superior standards of living in Lexington compared with the rural districts from which they came.

Virginia rural organization trends and needs, W. E. GARNETT (*Virginia Sta., Rural Sociol. Rpt. 30 (1944), pp. 13+, illus. 2*).—This report of a committee appointed to revise the program of the Virginia Farm Bureau is a synopsis of several research projects upon community trends and development. Included are suggestions for desirable voluntary rural organization activities and a discussion of unmet needs and how to meet them.

Forward steps in Virginia rural health and medical care, W. E. GARNETT (*Virginia Sta., Rural Sociol. Rpt. 29 (1944), pp. 12+*).—This is a report, with recommendations, of the Sponsoring-Advisory Committee Meeting on the Virginia Rural Health and Medical Care Study, held at Lynchburg June 2–3, 1944, and of the executive committee held July 7. Background findings from other studies are presented in four appendixes.

Prepayment medical-care plans for low-income farmers in Ohio, R. L. McNamara and A. R. Mangus. (Coop. U. S. D. A.). (*Ohio Sta. Bul. 653 (1944), pp. 29+, illus. 1*).—In this study of prepayment medical care, planned in cooperation with the Farm Security Administration, it was found that under FSA plans females received a greater volume of physicians' services than did males, that adults received more than young people and children, and that tenants received a larger share of physicians' services than did owners. Persons of low economic status received more of such services than those more advantaged. Members of small-sized households received more of such services than those who were members of larger-sized households. Persons with little schooling received more services than those more advanced, and medical service was greatest in the winter months and least in the summer. More than one-half of a physician's contacts with patients were for treatment of respiratory and digestive disorders and diseases and conditions of the reproductive and urinary organs. Farm Security Administration plans were subject to a highly selective turn-over resulting in a situation wherein participants consist of a disproportionately large number of people requiring an extensive amount of medical care. FSA medical service met only a part of the total need for medical care. The volume of medical services received by participating families was in excess of that generally received by farm families, but still far below adequacy as defined by competent authorities. It is concluded that regardless of a proper distribution of risks among participants, the low-income FSA families will be unable to pay the family costs of an adequate health insurance program.

FOODS—HUMAN NUTRITION

Estimation of food value by chemical methods of another series of edibles consumed in Bihar, K. Mitra and H. C. Mittra (*Indian Jour. Med. Res., 30 (1942), No. 2, pp. 299–307*).—In continuation of investigations already reported (E. S. R., 87, p. 589), the results of analysis of a further series of 80 items are presented. Calcium, phosphorus, and proximate constituents are reported for 4 grain foods; 6 flesh foods; 22 fruits; 44 vegetables, including leafy types, roots and tubers, and miscellaneous vegetables; and buffalo, goat, and cow's milk, and buttermilk (buffalo). Hindi or local names, English names (where available), and Latin names are given.

The determination by chemical methods of the food values of yet another batch of edibles, K. Mitra and H. C. Mittra (*Indian Jour. Med. Res., 31 (1943), No. 1, pp. 41–43*).—Data obtained in the present investigations are reported for proximate constituents and Ca and P contents of 50 foods utilized in India. These include 2 kinds of grain foods; 14 of flesh foods—including several kinds of turtle meat, prawn, crab, lobster, meat of narrow-snouted crocodile, fish roe, and venison; 9 of fruits; 10 of leafy vegetables; 9 of root vegetables, and 6 of other vegetables. The foods are designated by Hindi or other local names, English names (where available), and Latin names.

A note on the presence of calcium oxalate in the maya fruit, C. F. Asenjo, J. A. Goyco, and M. del C. Fernández. (Puerto Rico Expt. Sta. et al.). (*Jour. Amer. Pharm. Assoc., Sci. Ed., 33 (1944), No. 10, pp. 344–345, illus. 1*).—The edible portion (pulp) of the maya fruit (*Bromelia pinguin* L.) was found upon microscopic examination to contain a large number of calcium oxalate crystals averaging about 108μ in length and 5μ in cross section. Whole maya fruit, whole pineapple, and the edible part of wild native (Puerto Rican) taro, all in the fresh state, averaged, respectively, 0.0838, 0.0089, and 0.1260 percent free and combined oxalic acid as $CaC_2O_4.H_2O$.

Nutritive value of soybeans, G. M. KINSMAN. (Univ. Ill.). (*Soybean Digest, 4 (1944), No. 12, pp. 9–10, 15*).—A brief review, with bibliography of 27 references.

Some problems in using soybeans as food, J. I. SIMPSON. (Univ. Ill.). (*Soybean Digest, 4 (1944), No. 11, pp. 43–44*).—This is a brief discussion of the utilization of vegetable soybeans and soybean flours and meals in the diet.

Nutritional value of bread containing soya flour and milk solids, R. S. HARRIS, M. CLARK, and E. E. LOCKHART (*Arch. Biochem., 4 (1944), No. 2, pp. 243–247*).—The eight breads prepared by a commercial bakery were kept constant with respect to the quantities of white flour, water, yeast, Arkady, salt, lard, sugar, and malt and were all enriched with vitamins and minerals at levels corresponding to existing flour standards. The skim milk solids content in the several breads varied from 0–6 percent and the full-fat soya flour content from 0–5 percent of the weight of the flour in the bread formula. To compare these breads with regard to the nutritive quality of their proteins, they were fed at a 10–percent protein (1.8–percent nitrogen) level to eight groups of rats receiving an otherwise similar complete diet. Weight gains of these animals (per 100 gm. of food or per gram nitrogen consumed) over an 8–week period showed that the bread containing 3 percent soya flour and 3 percent skim milk solids produced the best growth, even superior to that of animals receiving breads made with 6 percent skim milk solids or 5 percent soya flour. A bread containing 2.3 percent skim milk solids and 3 percent of the soya flour was superior to a bread containing 6 percent milk solids not fat. The superior values of blended proteins were also shown in the case of bread containing 1.5 percent skim milk solids and 2.5 percent soya flour as compared with one containing 4 percent skim milk solids or 3 percent soya flour. The bread containing neither soya flour nor skim milk solids showed the poorest growth of all.

Some factors affecting the behavior of Cheddar cheese in cooking, C. PERSONIUS, E. BOARDMAN, and A. R. AUSHERMAN. (Wis. Expt. Sta.). (*Food Res., 9 (1944), No. 4, pp. 304–311, illus. 1*).—Experimentally produced Cheddar cheese, prepared from pasteurized milk, and other samples of known type and approximate age obtained on the retail market, were used in this study to determine the effects on cooking behavior of the cheese due to its composition and degree of ripening, and to the intensity and length of heat treatment and the reaction of the dispersing medium. Six lots studied over a 12–mo. period of ripening showed a progressive increase in the amount of the total protein that was soluble in acetate buffer solutions, pH 4.6, containing 1 percent and 5 percent NaCl. In four lots of normal fat content there was a progressive improvement in cooking quality over 12 mo. of ripening.

"This improvement was more rapid in a high-moisture cheese. In general, cheese ripened in hermetically sealed cans showed a more rapid improvement in cooking quality than part of the same curd ripened in a daisy. There was no direct correlation between the percentage of the total protein that was soluble and the observed cooking quality. However, the cooking quality improved and the amount of soluble protein increased with the length of the ripening period. Low-fat cheeses were conspicuously poor in cooking quality. Relatively high temperatures and long periods of heating tended to cause greater separation of fat from a cheese; matting, stringing, and toughening of the cheese mass were also increased.

"The acidity and the ion content of the liquid with which a cheese is combined apparently affect the blending qualities and the tendency of the mixture to mat or string on heating. Between pH 5.2 and 5.6 the greatest tendency for matting and stringing was observed. At acidities between pH 4.0 and pH 4.7 to 5.0 the cheese separated from the liquid with which it was combined as hard, curdlike particles, while within the range pH 5.8 to 8.0 appreciable dispersion was observed. It is possible that the calcium-removing property of the phosphates in the buffer solutions of pH 5.8 and above played a major part in increasing the dispersion of the cheese."

A microscopic study of the behavior of fats in cake batters, G. T. CARLIN (*Cereal Chem., 21 (1944), No. 3, pp. 189–199, illus. 6*).—Batters of the pound cake and white layer cake type were used, being maintained at a temperature of 75° F., except as heated in baking. Microscopic observations (recorded by means of photomicrographs) were made on minute portions of the batter pressed out by a cover glass on a glass slide. The fat was colored with fat-soluble dyes to facilitate following its behavior prior to and during baking. Changes during baking were followed in batters cooked or baked on the slides by means of a specially devised heating stage. Batters thus baked were compared with similar batters removed from cake layers during the regular process of baking. At the point at which batters became baked the characteristic birefringence of the starch granules under polarized light disappeared. This loss of birefringence when a film of the batter was baked on the slide was confirmed with cakes baked in a normal manner. The observations indicated further that layer and pound cake batters are apparently suspensions of air bubbles in fat distributed in a medium of flour and liquid.

"Little, if any, liquid appears to be emulsified in the fat. Soluble ingredients such as salt and sugar are dissolved by the water of the batter. The air spaces in layer and pound cake batters are invariably surrounded by fat. During baking, the fat quickly melts and releases its suspended air to the flour-water medium. Gas produced by baking powder finds its way into the air spaces already existing in the batter. . . . There is a movement of air spaces at all times during the baking process. This movement appears to follow a definite convection pattern until the end of the baking process is neared. At this stage the movement becomes violent and without direction. The use of monoglyceride emulsifying agents produces a finer dispersion of fat throughout the cake batter."

Effect of flavor on nutritive value of fats, R. K. BOUTWELL, R. P. GEYER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc., 55 (1944), No. 3, pp. 153–155*).—Experiments are reported refuting the claim of Deuel et al. (E. S. R., 89, p. 759) that the superiority of butterfat over corn oil or other vegetable fats in growth-promoting properties for young rats receiving lactose as a sole carbohydrate is due to a greater food consumption because of the butter flavor diacetyl.

Four groups of 12 weanling rats each were followed for 6 weeks on diets (fed ad libitum) in which lactose was the sole carbohydrate and the fat consisted of butterfat, corn oil, butterfat from which diacetyl had been removed chromatographically, and corn oil to which 0.0005 percent diacetyl had been added. The average gains on the four rations were 145, 110, 152, and 124 gm., respectively. The animals receiving corn oil were decidedly inferior in appearance to those receiving butterfat. Two control groups receiving dextrose as carbohydrate, with butterfat and corn oil as fats, grew at approximately the same rate, gaining 186 and 183 gm., respectively, and were of normal appearance at the end of the experiment.

Experiments on garlic and onion extracts, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 10, pp. 305, 313*).—This brief report, based on preliminary tests, suggests that for commercial trial the garlic extract be made by treating 100 parts of ground garlic with 120 parts of 100-grain vinegar, 25 parts of salt, and 180 parts of water (all measurements by weight), allowing the mix to stand overnight, then pressing, straining, and bottling. Extraction with brine or by treatment with water, salt, and Pectinol yielded products which darkened rapidly. Onion extracts were also prepared, but these were not considered so desirable as onion powder prepared by hammer milling and sieving the dehydrated onions.

Microbiological problems in the preservation of meats, L. B. Jensen (*Bact. Rev., 8 (1944), No. 3, pp. 161–188*).—This review, with 117 reference citations, discusses: (1) Action of certain bacteria on myohemoglobin and nitric-oxide derivatives formed in cured meats, (2) ante-mortem and post-mortem changes of tissues of food animals, (3) action of micro-organisms on fats, (4) effect of nitrates and nitrites on bacteria in cured meats, (5) action of NaCl on bacteria, and (6) some recent developments in meat technology.

Curing important to southern lockers, D. E. Brady. (N. C. State Col.). (*Quick Frozen Foods, 6 (1944), Nos. 12, p. 53, illus. 3; 13, p. 57, illus. 1*).—A meat-curing service is recommended for operation along with meat-freezing service by southern locker plants, in order that the meat supply of southern farmers may be extended and varied, with assurance against curing loss.

Meat dehydration: A report of research work for its commercial development (*U. S. Dept. Agr. Cir. 706 (1944), pp. 46+, illus. 7*).—On the basis of boned, trimmed, fresh meat, dehydration is estimated to save approximately 60–70 percent in weight. Reduction in volume, when the dehydrated product is properly compressed, is from 65 to 73 percent, approximately.

Of the various processes studied, the vacuum rotary seemed likely to have the most advantages. It involves rotary agitation of the meat in a steam-jacketed cylinder under reduced pressure. Meat processed by this method had good rehydration capacity, thiamine retention, palatability, and keeping quality, and had other desirable characteristics. The vacuum rotary process, moveover, is simple, combining both precooking and drying in one machine. Some of the other seven processes examined were superior, however, with respect to rate of drying, continuity of operation, palatability of freshly dehydrated product, or in other points. Control over processing temperatures and of air oxidation was found to be important to successful dehydration. Dehydrated raw meat, as removed from the drier, appeared to be generally a better product than dehydrated cooked meat but presented a problem in keeping quality requiring further study. High stability in dehydrated meat (resistance to the development of rancidity) was found to be associated with high palatability. Tests for oxidation and rancidity showed the importance of using, for dehydration, fresh meat that had not been aged. Meat may be fully acceptable for table use and yet be unsuitable for dehydration because of previous action by enzymes or exposure to air oxidation. The use of small quantities of gum guaiac as an antioxidant improved the keeping quality of dehydrated meat. Conditions of processing, packaging, and storing that reduce exposure to air helped in obtaining good keeping quality.

Metal cans were found the best containers for dehydrated meats and kept them in satisfactory condition for long periods. Besides affording good protection against rough handling and contamination, such containers exclude air and otherwise preserve the palatability of the meat better than others, especially at nonrefrigerating temperatures. The most satisfactory substitute for cans was the envelope-type, lead-foil bag. Some paper and other nonmetallic containers, fairly satisfactory under favorable storage conditions, failed when exposed to high humidity and frequent temperature changes. Dehydrated meats canned by the vacuum-pack process retained their palatability slightly better than those canned in an atmosphere of nitrogen. Nitrogen-pack products were slightly better than air-pack meat. Low storage temperatures aided in retaining palatability of canned dehydrated meats.

Dehydration of meat scrapples, B. C. CARL, B. M. WATTS, and A. F. MORGAN. (Univ. Calif.). (*Food Res., 9 (1944), No. 4, pp. 319–327*).—A scrapple that dehydrated successfully and that did not turn rancid readily was made from ground lean pork 1 lb., water 1 cup, polenta-grind corn meal ½ cup, salt 1 teaspoon, and pepper ⅛ teaspoon. In developing this formula it was found (1) that the fat content of the fresh pork used should not be over 20 percent, preferably 12 to 18 percent, corresponding to a fat content in the dehydrated scrapple of about 30 percent; (2) that the amount of water used should be the minimum to hydrate the corn meal; (3) that the corn meal should be coarse enough to allow adequate rehydration of the scrapple but not so coarse as to cause excessive tenderness; and (4) that only salt and pepper should be used as seasoning, since other seasonings sometimes imparted undesirable flavor. In making the scrapple the water was added to the cooked meat and brought to a boil and the corn meal and seasoning were added gradually with stirring. When the scrapple began to thicken it was placed in a double boiler, steamed for 30 min., and then moulded. Slices about 3/16-in. thick were spread on trays and dehydrated at 155° F. for 5–6 hr.

"Scrapple may be eaten in the dehydrated form or reconstituted into patties, meat loaf, or creamed preparations. It can be compressed to about 60 percent of its original volume to save storage and shipping space. When compressed it contains about 5 calories per cubic centimeter and has a density of about 1 gm. per cubic centimeter. An average scrapple had a moisture content of 4 percent, a protein content of 37 percent, and a fat content of 28 percent. Palatability tests showed that dehydrated scrapple is much preferred to dehydrated ground pork, either raw or steamed. Other cereals, particularly barley, cracked wheat, and chipped rye, may be substituted for part of the corn meal to improve the flavor. Other meats may also be substituted for pork, beef being particularly successful."

Observations on dehydraters, E. BALOG and W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 11, pp. 329–331, 346*).—Data obtained on the moisture content of carrots, potatoes, and cabbage taken from different locations throughout commercially operated tunnel dehydrators showed that moisture evaporated very rapidly from the fresh product in the early stages, but that the final stages of drying were slow. Since the moist product in the initial stages of drying can withstand higher temperatures than the product at the final stages, it is suggested that the drying be started with high temperature and high air velocity and that the partially dried product be placed in a second tunnel or other drier to be finished in air at lower temperature and velocity than in the primary tunnel. It is also suggested that trays of the partially dried product be doubled up or trebled up in some cases so that one secondary tunnel may serve two or three primary tunnels.

Some factors influencing quality of dehydrated, canned, and frozen green beans, D. C. ALDERMAN and B. NEWCOMBE. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 12, pp. 365–368, illus. 3*).—"Green beans of the Stringless Greenpod variety were cut crosswise in pieces 1¼ in. and ¼ in. long, lengthwise in fourths, and processed by dehydration, canning, and freezing. After processing, they were divided into four lots. The first was reconstituted and tested for palatability and quality immediately, and the other three lots were stored and tested after 1, 3, and 6 months' time. The judges scored the product as to desirability of color, consistency, flavor, and rehydration, by indicating whether each of these quality factors was very good, good, fair, or poor. The experiment, which was replicated four times, was set up on a split plot design and data reduced by applying analysis of variance.

"The results obtained from this experiment show clearly that dehydrated shredded green beans are not only superior to canned beans, but equal to those frozen. Here, then, may be found another market for green beans. The dehydrated shredded beans were significantly superior to the dehydrated beans cut crosswise. The inability of these long-cut and short-cut beans to rehydrate was largely responsible for their poor quality scores.

"The ratings accorded color and flavor of the canned beans were inferior to those of the dried shreds and frozen beans. All of the beans, dehydrated, canned, and frozen, decreased significantly in quality after 6 months' storage."

Some factors affecting the variability of dehydrated carrots, L. K. MANN and E. WEIER. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 10, pp. 309–311, 317, illus. 1*).—Variations in the amount and distribution of starch and carotene in the raw carrot and changes occurring in these constituents during dehydration were followed in histological studies of carrot sections. Starch, present as individual grains, was not uniformly distributed in the root, but when present was most often to be found near the boundary between the central core and the outer portion. When the raw carrot was blanched preliminary to dehydration the starch was gelatinized. If the carrot dice were heated to blanching temperature of 170° F. or higher within 30–60 sec. the gelatinized starch appeared as an amorphous mass within the cells. If the carrot dice were heated more slowly to the same blanching temperature, the starch swelled and gelatinized and then became converted to dextrin. In carrot dice dehydrated without blanching, the starch remained in the form of grains if the drying temperature was kept below 120° until about half of the moisture was lost.

Carotene distribution in the raw carrot was exceedingly variable. Because of this variability in distribution the external color of the carrot was not a good index of carotene content of the whole carrot, at least when small differences were concerned. Moreover, the color of the carrot was found to be modified by the presence of air in the tissue. Carotene in the dehydrated tissue often appeared in small yellow droplets of carotene in oil; occasionally the pigment remained in crystallike bodies after dehydration; and in some cases there was evidence of carotene breakdown.

Effect of syrup treatment on compressing of dehydrated carrots and cabbage, B. J. CYTRON, E. BALOG, and W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 11, pp. 338–339*).—"The compressibility of dehydrated carrots at relatively low temperatures (100°–120° F). and adhesion of the compressed products were greatly improved by dipping blanched carrots in 50° Brix dextrose solution and blanched cabbage in 30° Brix dextrose solution before dehydration. The dried products were not too sweet in flavor. Yield was increased. Keeping quality is under study and will be reported later."

Sulphite retards deterioration of dehydrated cabbage shreds, G. MACKINNEY and L. B. HOWARD. (Univ. Calif. and U. S. D. A.). (*Food Indus., 16 (1944), No. 5, pp. 75–76, 126–129, illus. 1*).—This report, based on information from laboratory tests, pilot-plant data, and industrial tests, discusses the adjustments necessary in individual plant operations to solve the problem of producing sulfited dehydrated cabbage under Army contract. Recent Quartermaster Corps specifications for dehydrated cabbage include a requirement for sulfiting, prior to dehydration, with limits of 750 to 1,500 p. p. m. of sulfur dioxide in the finished product.

Variety, place of production, and stage of maturity as factors in determining suitability for dehydration in white potatoes, J. S. CALDWELL, C. W. CULPEPPER, and F. J. STEVENSON. (U. S. D. A.). (*Canner, 99 (1944), Nos. 1, pp. 26–34; 2, pp. 16, 18, 24–30*).—This study, carried out with early-crop potatoes from the more important southern potato-producing districts, is in extension of earlier work using potatoes from the more important northern potato-producing districts

(E. S. R., 90, p. 272). The material employed was supplied by cooperators in the National Potato Breeding Project in Texas, Florida, Louisiana, South Carolina, Virginia, California, Maryland, and New Jersey. There were 34 lots of material, 27 dug at commercial-harvest stage when the vines were still green, and 7 dug 10 days to 2 weeks later when the vines had become dead and dry. As the lots of potatoes were dug they were shipped by express or truck to Beltsville, Md., where they were dehydrated within 2 to 3 days of receipt by methods employed in the earlier study. Dry yield, as percentage of prepared strips placed in the dehydrator, varied from 15.1-25.3 percent, with the majority of the samples falling within the range of 17–20 percent and with the delayed-harvest potatoes showing larger dry yields than the physiologically immature, commercial-harvest samples. The tendency to dark discoloration during preparation for drying was most pronounced and difficult to control in the immature potatoes; imperfect control was attained by dipping the potatoes in salt solution prior to blanching, but dipping into a dilute sulfur dioxide solution very satisfactorily prevented the darkening. The distinct yellowing observed in all lots within 30–60 min. after being placed in the dehydrator was attributed to the presence of carotene in the potatoes.

When cooked and prepared as riced potato, none of the samples was of the highest quality; 13 ranked good to very good, the remaining 21 from very good through fair or acceptabie to poor. The final quality grade of the samples was directly dependent upon the degree of maturity as indicated by the specific gravity. On the whole, the dehydrated products made from early-crop potatoes (from the southern region) ranked significantly lower in quality and general desirability than those from the late-crop potatoes (northern grown). This result is considered as due in part to the commercial custom of harvesting the early potatoes when the plants are still green and in part, possibly, to imperfect adaptation of the varieties. It is stressed that only fully mature potatoes should be used for dehydration.

A note on the blanching of potatoes, W. V. Cruess. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 9, p. 260*).—This note, concerned with the intent of a previous communication (E. S. R., 91, p. 480), points out that a slightly positive peroxidase test in dehydrated potatoes appears to have no great significance as to keeping quality provided the potatoes have been steam blanched sufficiently to cook them through without mushiness and to destroy most of the peroxidase reaction. Steam blanching is recommended in preference to water blanching.

Cooking dehydrated vegetables (*U. S. Dept. Agr., Bur. Human Nutr. and Home Econ., 1944, AIS–8, pp. 20*).—General directions for cooking so as to preserve the maximum of food value and flavor are presented, together with specific directions and recipes for cooking dehydrated potatoes, sweetpotatoes, carrots, beets, corn, peas, snap beans, spinach, broccoli, cabbage, cauliflower, onions, and mushrooms.

Wartime vegetable salting, F. W. Fabian. [Mich. Expt. Sta.]. (*Food Indus., 16 (1944), No. 5, pp. 72–74, 135, illus. 1*).—The process is described in detail with respect to both dry salting and brine methods. It is pointed out that vegetables should be blanched for salting, since the flavor of the final product is better than if unblanched vegetables are used. Vegetables should be stored in clean barrels, crocks, or tanks, and if wooden vessels are used they should be paraffined on the inside. Paraffined barrels completely filled are most satisfactory for commercial storage. All vegetables, whether salted dry or wet, ultimately should be covered with brine. Vegetables salted in open containers should be weighted to effect complete immersion. The tops of such containers should be covered with about 1 in. of paraffin to prevent scum formation and evaporation. The dry method of salting is particularly applicable to leafy vegetables which contain sufficient juice to cover them. Cucumbers, peppers, and tomatoes, because of their tough skins and soft interiors tend to collapse if dry salted and should be preserved in brines; cauliflower and onions, because of their lack of juice, should also be brine salted. High dry-salt concentrations are used for vegetables in which no fermentation is desired, as with corn, peas, and green lima beans, for example. Salt exerts a selective action on bacteria. In concentrations of 2.5 to 5 percent, rapid fermentation is generally permitted; higher concentrations, up to 15 percent, decrease the rate of fermentation. A concentration of salt greater than 20 percent is required to prevent spoilage.

Salting Early June and Alaskan peas, C. K. Wadsworth and F. W. Fabian. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 10, pp. 298–301, 316*).—Previous work having shown that high salt concentrations must be used with brined peas (E. S. R., 89, p. 609), the tests here described were conducted with brine concentrations (calculated) of from 15 to 25 percent. At these concentrations, whether dry salt or brine was used, the bacterial counts were low and there was very little acid production. In dry salting it was necessary to distribute the salt thoroughly and evenly among the peas to prevent spoilage. It was also found necessary to supplement the dry salt with enough brine of the same concentration to cover the peas, since the dry salted peas did not produce enough brine to cover more than 80 percent of them and those left uncovered turned white and were useless. The salt penetrated the peas very quickly, 60 percent of it being taken up within 20–25 min. Conversely, the brined peas gave up their salt quickly, from 53 to 56 percent of that withdrawn in 150 min. of soaking being removed within 5 min. after placing the peas in cold water. Unblanched peas were tougher and had poorer color and flavor than blanched peas. Increasing the salt concentration increased the toughness of the peas, so that not over 20 percent salt was found desirable; at least 18 percent was necessary, however, to prevent spoilage. Analysis of the raw, blanched, and brined peas indicated that practically all of the ascorbic acid in the peas was lost during salting, but that carotene losses were relatively small; in some instances practically none of the carotene was lost, while in others as high as one-third of the original carotene content disappeared.

The utilization of green tomatoes, F. W. Fabian and C. K. Wadsworth. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 12, pp. 361–362, 368*).—It is suggested that green tomatoes be salted or pickled in place of cucumbers in seasons when early frosts kill the cucumbers. Even several hard frosts that kill both the cucumber and tomato vines and injure the cucumbers often leave the green tomatoes uninjured. Sucessful experience in salting and pickling the green tomatoes and using them in green tomato relish is noted. Juices expressed from tomatoes at various stages of ripeness were analyzed for citric acid and ascorbic acid. The green tomato juice was unpalatable, but juices from the partially ripe fruits were acceptable.

The explosion vs. usual method of peeling vegetables and fruit, H. D. Brown and C. Murnane. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc., 44 (1944), pp. 190–192, illus. 1*).—The method developed involved subjecting fruits and vegetables placed in a retort with pressure and temperature controls to a temperature of from 212°–250° F. and a pressure of 0–15 lb., depending upon the product being peeled, and then drawing a vacuum of from 25–27 in. by shutting off the steam and rapidly forcing cold water into the top of the retort. Peppers, potatoes, sweetpotatoes, peaches, and apples were successfully peeled and lima beans freed of their pods by this method. Holding the temperature at 240° for 2 min., before the vacuum was created, effectively inactivated enzymes, so that the beans thus shelled were ready for quick freezing. Peeling losses for potatoes of several varieties peeled by the explosion method amounted to 7.6–12.8 percent as compared with 11.9–22.7 percent by the abrasion method. Losses for Stayman Winesap apples peeled by explosion and with a hand-operated peeling machine were 3.8 and 16.6 percent, respectively. The explosion method was particularly effective in removing skins from potato eyes, and apples cored by explosion needed no further trimming, especially if the skin was cut at the stem and blossom ends before explosion.

All patent rights for this process have been assigned to the Ohio State University Research Foundation.

Explosion method peels vegetables and fruit, H. D. BROWN. (Ohio State Univ.). (*Quick Frozen Foods, 6 (1944), No. 12, p. 30, illus. 1*).—Essentially noted above.

Commercial freezing of foods, J. G. WOODROOF. (Ga. Expt. Sta.). (*South. Canner and Packer, 5 (1944), No. 10, pp. 6–8, 20–21, illus. 3*).—This general survey of the processes and problems involved in the freezing of fruits and vegetables (including sweetpotatoes in particular) is based on Georgia Experiment Station Bulletin 233 (E. S. R., 91, p. 769).

Notes on frozen pack fruit syrups and concentrates, W. V. CRUESS. (Univ. Calif.). (*Canner, 99 (1944), No. 19, pp. 14–15; also in Fruit Prod. Jour. and Amer. Food Mfr., 24 (1944), No. 2, pp. 36, 61*).—A brief review of early and recent experiments at the California Station indicates that fruit sirups made by addition of sugar to the juice, to about 50° Brix, keep very well in frozen storage at 0° F. Fruit concentrates made by freezing concentration or vacuum concentration likewise remain practically unaltered in flavor, color, and aroma for long periods at 0°. The frozen products are recommended for the preparation of chilled beverages and the red concentrates in particular for use as bases for punches.

Freezing provides an answer to sweet potato problem, J. G. WOODROOF and I. S. ATKINSON. (Ga. Expt. Sta. et al.). (*Food Indus., 16 (1944), Nos. 7, pp. 79–81, illus. 2; 8, pp. 84–86, illus. 2*).—This paper outlines and presents a flow sheet of the steps involved in freezing sweetpotatoes. These steps applied to thoroughly cured sweetpotatoes include washing, grading, lye peeling and subsequent washing, inspecting and trimming, pressure cooking, pulping, filling into cans, and freezing at —20° F. The frozen sweetpotatoes stored at 0° offer a year-round supply of this vegetable. Grading is essential before processing, since the peeling and cooking steps are varied with the size, uniformity, and smoothness of the samples. Of the eight suggested methods of peeling (boiling water, salt solution, lye solution, baking, mineral oil, gas flame, abrasion, and hand peeling) a 5– to 6–min. treatment with 10 percent lye solution maintained at boiling temperature is recommended. The lye solution loses strength at the rate of about 1 lb. per bushel of sweetpotatoes peeled, and the sweetpotatoes lose about 30 percent of their weight in the peeling and trimming. Pre-cooking is best accomplished by steaming the peeled potatoes under 10–lb. pressure to an internal temperature of 190°.

The cooked sweetpotatoes may be frozen whole, sliced or as a pureè, but the latter form is preferred, since sweetpotatoes of all sizes above 1½ in. diameter may be used, storage space may be minimized, close trimming is not necessary, color is uniform, and measuring, weighing, and handling are facilitated. Discoloration of the puree is prevented by adding about 0.3 percent citric acid, which lowers the pH from the normal of 6.1 to 5 or below. It is estimated that sweetpotato puree can be prepared, frozen, and stored for 6 mo. for about 7 ct. a pound. Approximately three-fifths of the starch of the sweetpotatoes is converted to maltose in processing and from 2 to 5 percent of the total carbohydrate may be lost in leaching.

Frozen tomatoes not too good, juice has possibilities. (U. S. D. A.). (*Food Indus., 16 (1944), No. 8, pp. 87–88, illus. 1*).—In tests at the U. S. D. A. Western Regional Research Laboratory whole and sectioned tomatoes preserved by freezing tended to have a sharp, strong flavor, and when thawed collapsed severely. The texture breakdown was still more pronounced after the tomatoes had been cooked. A pulpy type, mild, highly colored, low acid tomato is recommended as the best for freezing. Only sound fruits of full-ripe maturity should be used. Skins and cores should be removed, and the whole or sectioned tomatoes should be packed, without blanching, into liquid-tight, air-resistant containers and frozen as rapidly as possible. Storage should be at temperatures around —10° F. Frozen tomato juice, which proved to be a better product than frozen tomatoes, was prepared by heating the cored fruit to 185° to 195° as rapidly as possible, expressing the juice with a screw-type expressor, cooling immediately, salting, packaging, and freezing quickly. Prepared in this way, the frozen juice retained a good color and a pleasant flavor which was somewhat different from that of canned juice. Sweet, low-acid varieties and sound, well-ripened, and full-flavored juices should be used for freezing. The greatest problem in freezing the tomato juice is the tendency for the liquid to separate from the pulp when thawed.

Experiments prove value of freezing baby foods, L. A. Hohl. (Univ. Calif.). (*Quick Frozen Foods, 6 (1944), No. 13, pp. 30, 36, illus. 1*).—Some of the problems involved in preparing and marketing frozen baby foods are discussed briefly. Tests on a laboratory scale with peaches, pears, and apricots indicated the necessity of blanching to prevent oxidative darkening and flavor deterioration and suggested a fruit : sugar ratio of 8 : 1 for peaches and pears and 3 or 4 : 1 for apricots. Because of their tartness, apricots were more satisfactory for baby foods if blended with milder fruits such as apples, peaches, or nectarines. Asparagus, beets, carrots, peas, green beans, and spinach, when precooked, pureed, and frozen, retained excellent color and flavor for storage periods of 1 yr. or more. Precooking, rather than blanching, is considered necessary for this type of product in order that the consumer would need only to thaw and warm it to the desired temperature before serving.

Blueberries for freezing improved by blanching, J. G. Woodroof and I. S. Atkinson. (Ga. Expt. Sta.). (*Refrig. Engin., 48 (1944), No. 4, pp. 275–278, 314, illus. 5*).—The woody texture developing upon storage of frozen blueberries was found to be prevented by blanching the berries preliminary to freezing. Blanching was successfully accomplished by passing the washed berries, in shallow layers, through a steam chamber for 1 or 2 min., or by immersing small lots of berries in boiling sirup containing 75 percent sugar for 15–20 sec., then allowing them to drain for 1 min. Histological examination of stained sections of the frozen berries showed the woody texture of the unblanched berries to be due to deposition of gritty material in the epidermal and subepidermal cells of the skins after about 6–mo. storage. This material continued to form for at least 2 yr. Steam blanching for 1 min. inactivated the enzymes causing this deposit, so that blanched frozen berries were improved in texture and tenderness (as determined by tenderometer tests); flavor, aroma, and palatability were also improved. The addition of dry sugar to blanched berries in the ratio of 5 : 1 improved the retention of flavor and other eating qualities. Woody texture was most pronounced in wild berries, slightly less in the Haygood and Ruby varieties, and considerably less in Rubel, Pioneer, and Cabot.

Blanching is essential, S. Bull. (Univ. Ill.). (*Quick Frozen Foods, 6 (1944), No. 12, p. 52*).—Blanching is stressed as a necessary step in preparing vegetables for quick freezing, in order to inactivate enzymes which if not destroyed will hasten undesirable oxidative changes in flavor and color and cause greatly increased vitamin loss.

What the locker plant operator should know about food poisoning, F. P. Griffiths. (Mass. Expt. Sta.). (*Quick Frozen Foods, 6 (1943), No. 5, pp. 45, 58*).—The rules enumerated emphasize the importance of using only the freshest, best quality foods for freezing, of blanching vegetables preliminary to freezing, of preparing and handling all foods under strictly sanitary conditions, of freezing them quickly in small-packing units, of storing at 0° F. or below, of preventing thawing and refreezing of food in locker storage, and of using the foods within a short time after removal from the locker.

The effect of harvest maturity on the canning quality of western-grown Elberta peaches, A. M. Neubert, M. K. Veldhuis, and W. J. Clore. (Wash. Expt. Sta. and U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 10, pp. 292–297, 315, 317*).—This study to determine the best maturity range for harvesting peaches for canning was conducted with the Elberta variety grown in the Yakima Valley in 1940, 1941, and 1942. The effect of harvest maturity on size of fruit, bruising during handling, withering during ripening, and quality and yield of canned fruit were studied.

As the maturity at harvest increased, the flesh of the canned peaches gradually decreased in firmness, although fruit requiring from 3 to 14 days to ripen possessed a good firm texture. Fruit requiring more than 14 days to ripen was too hard, and that requiring less than 3 days was too soft. As maturity advanced until only about 6 days were required for ripening, flavor improved, but when less than 3 days was required the flavor was rather mild. The color of the canned fruit and the clarity of the sirup were not particularly associated with the maturity of the fruit at harvest. The peaches increased in size and weight at a rate of about 10 percent for each 3 days they were left on the tree. Peaches may be left on the tree without serious loss from bruising until within about 3 days of canning ripeness. The maturity at harvest did not seriously affect the peeling characteristics of the fruit.

"With all factors taken into consideration, the most satisfactory harvest maturity for Elberta peaches, as grown in the Pacific Northwest, was found when the fruit was about 75 percent yellow . . . and gave an average pressure test on peeled fruit of from approximately 4 lb. with a 7/16-in. plunger to approximately 9 lb. with a 5/16-in. plunger. Such fruit required from 3 to 7 days to ripen for canning. Color-picking, involving two or more harvests, would appear necessary to attain this maturity throughout a harvest."

The effect of storage on the canning quality of Elberta peaches, M. K. Veldhuis and A. M. Neubert. (U. S. D. A. and Washington Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 9, pp. 276–281*).—The effect of storage at 31°, 37°, and 45° F. on the canning quality of Washington-grown Elberta peaches was studied in the 1941 and 1942 seasons. The peaches were stored on trays in cabinets so constructed as to permit temperature and humidity control. The results of the study are summarized as follows: "Storage did not improve the canning qualities; but under the proper conditions the fruit could be held up to 3 or 4 weeks and still be acceptable. Peaches stored at 31° gave a satisfactory canned product after longer periods of storage than did the fruit stored at 37° or 45°. Steam-peeling characteristics of fruit stored at 31° remained satisfactory and the flavor of the canned product was better than that of fruit stored at 37° or 45° for the same length of time. The peeling characteristics of fruit stored at 37° and 45° became unsatisfactory in a short time. Riper fruits gave better results in storage at 31° than greener fruit."

If storage for canning is necessary, it is suggested that Elberta peaches be held as near 31° as possible and that the maturity of the fruit be within 5 days of full canning ripeness; if not this mature, it should be allowed to ripen before storage. The storage period should not be longer than necessary and should not exceed 4 weeks. Badly bruised fruit should not be stored.

Ripening Washington-grown Elberta peaches for canning, A. M. NEUBERT and M. K. VELDHUIS. (Wash. Expt. Sta. coop. U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 12, pp. 357–360, 379, 381*).—Five different lots of commercially grown fruit in two maturity groups on the basis of color were ripened under a total of 24 ripening conditions during a 3-yr. period. One part of each lot of peaches was ripened in an open box at room temperature, one part was ripened in direct sunlight, and the rest was ripened in a cabinet under controlled conditions of temperature and humidity. The different portions were ripened at temperatures varying from 65°–95° F. and at high or low relative humidities (over or below 60 percent, respectively). After 2–3 days of ripening the peaches were observed for flesh color and ease of pitting and peeling and then canned. After 3–6 months' storage the canned samples were scored for quality.

Increasing the temperature of storage accelerated the rate of ripening and resulted in a deeper yellow color in the canned peaches. Wilting was an important factor only in greener peaches ripened above 85° under conditions of low humidity and in fruit ripened in direct sunlight. Peaches ripened in cabinets at 95° were difficult to steam peel. Freeness of the pit was not affected by any of the ripening conditions, but internal break-down occurred more frequently at the higher ripening temperatures. The most satisfactory ripening temperature was 75°; at this temperature the peaches attained a medium yellow color, were easily peeled, and reached a maximum flavor. The flavor of peaches ripened in open boxes at room temperature (70°–80°) was equal to that of peaches ripened in cabinets at 75°, but such fruit was lighter in color. At 75°, humidity did not appear to be a critical factor over the range ordinarily attained in normal practice. Ripening at low humidities, or at 65°, resulted in canned products of light yellow color.

Botulism from home-canned beets, B. L. HALL (*Jour. Lab. and Clin. Med., 29 (1944), No. 7, p. 702*).—A brief report is given of three cases of botulism, two with fatal outcome and the third with eventual recovery following treatment with botulinus antitoxin, from home-canned, incompletely sterilized beets from which, on examination, botulinus toxin type A was obtained.

Jellied fruits and vegetable sauces—postwar possibilities of low methoxyl pectins, G. L. BAKER. (Del. Expt. Sta.). (*Food Packer, 25 (1944), No. 8, pp. 31–32*).—This brief discussion, based on an extensive experimental survey noted elsewhere (E. S. R., 91, p. 638), of the effect of methoxyl content of pectins upon gel characteristics at different concentrations of sugar, gives a few examples showing how gels of low soluble solids content (30 percent) may be prepared.

Recent developments in fruit juices, W. V. CRUESS. (Univ. Calif.). (*Amer. Fruit Grower, 64 (1944), No. 11, pp. 11–12*).—This brief discussion points to the greatly increased production of canned fruit juices since 1935 to a high of 39,202,000 cases in 1943. Apple juice; fruit and vegetable juice blends, of which an orange-carrot blend was the most pleasing of those tested; an improved prune juice prepared by hot-water extraction of dried prunes; citrus juices; pineapple juice; grape juice; dried juices; frozen-pack juices; and concentrates, particularly those prepared by freezing concentration, are noted as among the most acceptable of the commercial fruit juice products.

Clouding and sedimentation in clarified apple juice, A. M. NEUBERT and M. K. VELDHUIS. (U. S. D. A. and Wash. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 11, pp. 324–328, 347*).—A total of 185 lots of pasteurized apple juice, including 57 control lots, was prepared, stored, and observed for sediment formation. The control juices were treated at room temperature for 15–24 hr. with Pectinol A (1 lb. per 100 gal.), filtered through duck with a filter aid, flash-pasteurized, bottled with no head space, sealed, cooled, and stored at room temperature. Treatment of other samples was varied by changing the filtration process, employing different pasteurization methods, varying the head space, and bottling with and without nitrogen or oxygen and by the use of various sedimentation methods. Of the 57 control juices, 5 remained clear for 12 mo. or longer and 5 became cloudy in 1 mo. The time between bottling and the formation of a cloud varied from 8 days to 2.5 yr. None of the other treatments afforded a dependable method for controlling or delaying sedimentation, which was quite general during storage of the products, regardless of the variety or maturity of the apples or the methods used to attain clarification. In general, juice clarified by pectin-decomposing enzymes deposited more sediment in a shorter period than did juices clarified by other methods. The period of stability of clarified apple juice appeared to depend on properties inherent in each particular lot of juice. These properties were not consistently controlled by any treatment studied. Analysis of the apple juice sediment showed it to be a rather inert substance similar in properties to the phlobaphenes. The formation of sediment appeared to be a colloidal phenomenon, and it is suggested that restabilization of the colloidal system after clarification offers the greatest hope for the control of the problem.

Bland apple sirup, H. H. MOTTERN and R. H. MORRIS, 3d. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 9, pp. 261–269, 283–285, illus. 2*).—This report, superseding an earlier one (E. S. R., 88, p. 441), deals at length with the manufacturing process, including the equipment needed, production results, cost of manufacture, and composition of the product.

Changes occurring in orange and grapefruit juices during commercial processing and subsequent storage of the glass- and tin-packed products, E. L. MOORE, E. WIEDERHOLD, and C. D. ATKINS. (U. S. D. A.). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 9, pp. 270–275, 285, illus. 3*).—A comparison of parallel commercial packs of citrus juices in glass and tin showed orange and grapefruit juices as packed to contain 98–99 percent as much ascorbic acid as the freshly extracted juice. The slower cooling of the bottled juices apparently did not decrease the retention of ascorbic acid, although it resulted in a slightly cooked flavor in comparison with the canned juices. In storage over a 6-mo. period the bottled orange and grapefruit juices retained somewhat less of their ascorbic acid (75–92 percent) than the canned juices (82–97 percent), and among these samples those stored at 80° F. retained less than those held in a cool room at 40°. A small quantity of dehydroascorbic acid appeared to be present in the juices at the end of the storage period. In general, the juices held in the cold room for 6 mo. satisfactorily retained their color and flavor. At 80°, however, the orange juices in glass and tin were off-flavor, with the bottled juices slightly better in taste than the canned juice; the bottled grapefruit juice was considered unpalatable at the end of the storage period, but the canned juice was still satisfactory.

Concentration of citrus juice by freezing, A. L. STAHL. (Fla. Expt. Sta.). (*Quick Frozen Foods, 6 (1944), No. 13, pp. 32–33, 36, illus. 6*).—The concentration of the deaerated juice was effected by freezing out the water and separating the concentrate from the ice by centrifugation at about 2,500 r. p. m. for 3 min. By repetitions of the process, the concentration of dissolved solids was increased up to about 60 per cent, at which point an eutectic mixture was formed and the ice and dissolved substances solidified together. The liquid phase, after the first centrifugations, contained about 25 to 30 percent soluble solids, and after the second about 48 percent soluble solids. At this latter concentration, orange, tangerine, and grapefruit concentrates kept for 2 mo. at ordinary room temperature and for 4 to 6 mo. at refrigerator temperature without spoilage; storage in the frozen state was more satisfactory, however—very slight changes in flavor and vitamin C content occurring in 22 mo. in the frozen juice. The frozen block was reconstituted directly without thawing by addition of a measured amount of tap water equivalent to that removed from the juice. The best orange concentrate was made using Pineapple, Valencia, and seedling oranges. The seedy varieties of grapefruit gave better concentrates than the seedless varieties. All varieties of limes and lemons tested gave good juice concentrates.

Investigations on fruit bars, R. WHELTON, R. H. VAUGHN, and G. L. MARSH. (Univ. Calif. et al). (*Fruit Prod. Jour. and Amer. Food Mfr., 23 (1944), No. 12, pp. 363–364, 381, illus. 1*).—Plate counts by a procedure described to determine the microbial population of fruit bars showed that the number of organisms (bacteria, yeasts, molds) present in commercial fruit bars, even when unpasteurized, was relatively small. SO_2 in the form of potassium metabisulfite added to fruit bars to simulate the effect of sulfured fruit showed a marked toxic effect on added yeasts. This probably explained the low counts observed with unpasteurized commercial bars. The process time required to kill a heavy inoculum of *Zygosaccharomyces* in the center of the bar was found to be longer than the theoretical process time estimated from experimental data on the rate of heat penetration of individual bars and existing data on the thermal death time of various micro-organisms in solution. This protective action of the fruit bar against heat and the variations in rate of heat penetration under different conditions make it necessary for the plant to evaluate its required pasteurization time individually by measurement of the time of penetration of heat and, if possible, the killing of micro-organisms in the bars under factory conditions.

An investigation of methods for preventing the hardening of fruit bars in storage indicated the need for some sort of moistureproof wrap and the desirability of a protective coating that would withstand the heat of pasteurization or could be applied after the heat treatment with care to prevent contamination before wrapping.

Effect of acids and sugar on viability of Escherichia coli and Eberthella typhosa, C. A. SHILLINGLAW and M. LEVINE. (Iowa State Col.). (*Food Res., 8 (1943), No. 6, pp. 464–476, illus. 6*).—Studies undertaken to learn more about the behavior of intestinal organisms in acid solutions simulating soft drinks, in order to determine possibilities of transmission of water-borne diseases by such beverages, led to the following observations: In a concentration of 0.02 N, which is approximately that employed in many beverages, the order of effectiveness of edible acids as germicides against *Escherichia coli* at 30° C. was tartaric>glycolic>phosphoric>lactic>acetic>citric. The order of effectiveness of the acids at a temperature of 30° was tartaric>phosphoric>lactic>citric, and at 0.6° phosphoric=lactic>tartaric>citric.

Comparing the germicidal efficiencies of acetic, lactic, and glycolic acids, it appears that the substitution of a hydroxyl group for one of the hydrogens on the alpha carbon atom markedly increases the germicidal efficiency of an acid. The germicidal efficiency of 0.02 N lactic acid at 30° was increased by the addition of 2.5 volumes of carbon dioxide or 10 percent of sucrose. A concentration of 0.02 N citric acid at 30° required 57.5 hr. to kill 99.999 percent of exposed cells of *E. coli;* addition of 10 percent sucrose reduced the killing time to 32 hr.; incorporation of 2.5 volumes of carbon dioxide with the citric acid reduced the killing time to 17.5 hr. *Eberthella typhosa* was much more susceptible to the effect of CO_2 and edible acids than was *Escherichia coli.* A table is presented indicating the storage periods required to reduce various inocula of *E. coli* in 0.02 N edible acids with or without CO_2 or sugar to a point of compliance with the U. S. Public Health Service standards for drinking water.

The tidal air of laboratory animals, M. KLEIBER ET AL. (Univ. Calif. et al.). (*Science, 99 (1944), No. 2583, p. 542*).—A general formula is presented for determining tidal air on resting and fasting laboratory animals, and results are given of experimental tidal air determinations under conditions more nearly resembling those found during inhalation experiments with infectious nuclei. The tidal air of albino Swiss mice, as calculated from the metabolic rate, when deprived of food and water, decreased from the start of the fast. By the basic heat formula the tidal air of any laboratory animal can be quickly estimated if the weight is known. The data presented point out the need of having animals in a basal state in order to reduce the number of variables in inhalation experiments.

Blood: A review of the recent literature, F. H. Bethell, C. C. Sturgis, O. T. Mallery, Jr., and R. W. Rundles (*Arch. Int. Med., 74 (1944), Nos. 1, pp. 36–77; 2, pp. 131–152; 3, pp. 197–233*).—Of particular interest from the standpoint of nutrition in this extensive review are the sections on hypochromic anemia (pp. 50–57), anemia in pregnancy (pp. 57–58), and methods and miscellaneous material (pp. 227–233). Literature references are given as footnotes, of which there are more than 600 in the entire review and 37 in the section on hypochromic anemia.

The effect of measurement technics on the values for red cell diameter, with some observations on the relationship between cell diameter and other factors in the blood picture, J. M. Leichsenring, E. G. Donelson, and L. M. Wall. (Minn. Expt. Sta.). (*Amer Jour. Physiol., 141 (1944), No. 2, pp. 270–273*).—Measurements of red blood cell diameters made with a 4-mm. objective on a dry blood film gave higher values than similar measurements on a moist film; the diameters were lowest when measurements were made on a dry film with an oil immersion lens. This was demonstrated in several series of measurements, including one in which parallel determinations on eight samples by these three methods, respectively, gave average cell diameter values in microns of 7.747, 7.550, and 7.114.

A highly significant relationship between the diameter and the volume of the normal blood cells was found to exist; it was indicated by the coefficient of correlation secured between the values for these two cell characteristics obtained on 252 blood samples. In these 252 bloods, from women students, high red cell counts were associated with cells of relatively small size in normal blood samples, as shown by a significant negative coefficient of correlation between cell count and cell diameter. This report is presented as paper No. 22 of the Regional Project of the North Central States relating to the nutritional status of college women.

Effect of manganese intake upon concentration of bisulfite-binding substances in blood, J. T. Skinner and J. S. McHargue. (Ky. Expt. Sta.). (*Amer. Jour. Physiol., 141 (1944), No. 5, pp. 647–650*).—Young rats were placed as control animals on three rations containing respectively, 0.4, 0.3, and 1.5 p. p. m. manganese; others were raised on these rations supplemented, respectively, with manganese to the levels of about 8, 6, and 500 p. p. m. The concentration of bisulfite-binding substances in the blood of rats raised on the rations containing 0.3 and 0.4 p. p. m., respectively, was practically the same as that in the blood of animals receiving 20 times as much manganese. Rats consuming the rations low in magnesium as well as in manganese were found to have a higher average concentration of bisulfite-binding substances in the blood than rats fed a milk diet. This condition was not altered by supplementing the ration with a high intake (500 p. p. m.) of manganese.

The blood picture of iron and copper deficiency anemias in the rat, S. E. Smith and M. Medlicott. (U. S. D. A.). (*Amer. Jour. Physiol., 141 (1944), No. 3, pp. 354–358*).—"A deficiency of iron or copper or both produces an anemia in the rat that morphologically is classified as microcytic and hypochromic. The feeding of pure iron to milk anemic rats leads to a significant increase in the mean cell volume which, however, still remains less than normal. The feeding of copper to milk anemic rats produced a rise in the erythrocyte count which was not accompanied by an increase in hemoglobin."

The relationship of copper to hematopoiesis in experimental hemorrhagic anemia, A. R. MAASS, L. MICHAUD, H. SPECTOR, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Amer. Jour. Physiol., 141 (1944), No. 3, pp. 322–328, illus. 2*).—Young growing dogs on a raw milk diet supplemented with crystalline B vitamins and manganese were made severely anemic by repeated bleeding. Dietary administration of iron at various levels up to 30 mg. produced no response, but daily administration of 3 mg. copper brought about an immediate and rapid increase in hemoglobin, hematocrit, and red cell counts to normal values.

"An iron deficiency in the presence of adequate (3 mg.) copper caused a nutritional anemia and a concomitant decrease in mean corpuscular volume. The administration of 10, 20, or 30 mg. iron with 3 mg. copper gave the characteristic remission in the anemic dogs."

Comparative cost of vitamin mixtures (*Jour. Amer. Med. Assoc., 126 (1944), No. 1, p. 29*).—This report of the Council on Pharmacy and Chemistry of the American Medical Association contains a tabulation of the selling costs and declared contents of 25 multivitamin preparations offered in June 1944 in one of the largest department stores in the United States. The price values are given per package with the number of capsules in each package and also in rate per 100 capsules. For purposes of comparison, a table is also given of the daily vitamin requirements, including the National Research Council daily recommended allowances and the U. S. Food and Drug Administration recognized minimum daily requirements.

The vitamin value of commercially prepared chile products, E. M. LANTZ (*New Mexico Sta. Press Bul. 997 (1944), pp. [4]*).—Data are presented to show the carotene and ascorbic acid content of individual samples of commercially prepared canned green chili, pickled green peppers, green chili sauce, and red chili sauce. The products varied widely in ascorbic acid values in particular. The canned green peppers, for example, ranged from practically nothing to almost 200 mg. of ascorbic acid per 100 gm., with carotene values ranging from 0.24–0.55 mg. per 100 gm. The red chili sauces were likewise variable in ascorbic acid content, ranging from 0–58 mg. per 100 gm.; carotene values were higher than in the canned green chili, varying from 1.5–26.1 mg. per 100 gm. Samples of heavy puree of fresh red chili pods supplied by the processor for analysis and used commercially as a base for the red chili sauce contained from 147–195 mg. of ascorbic acid and approximately 10–12 mg. of carotene per 100 gm. The products prepared from dried red chili contributed comparatively high amounts of vitamin A, but practically no ascorbic acid.

Fortification of milk with vitamins and minerals (*Jour. Amer. Med. Assoc., 126 (1944), No. 7, pp. 432–433*).—This discussion sets forth the reasons for the conclusion of the American Medical Association's Council on Foods and Nutrition that the "fortification of milk with vitamin A, thiamine, riboflavin, niacin, iron, and iodine or any one of these materials does not serve a public health need sufficiently to warrant Council acceptance of the fortified product."

Clinical adequacy of a single measurement of vitamin A absorption, E. L. PRATT and K. R. FAHEY (*Amer. Jour. Diseases Children, 68 (1944), No. 2, pp. 83–85, illus. 2*).—From a study of the rates of absorption of vitamin A for 112 patients, aged 4 weeks to 12 yr., with chronic disturbance of nutrition, it is concluded that for patients in this particular age group a single determination of vitamin A and carotenoids in the blood, taken 4 hr. after the administration of a test dose of percomorph liver oil for infants under 6 mo. of age or 5 hr. after the test dose for older children, provides information concerning the rate of absorption of vitamin A of the same clinical value as that obtained from more frequent determinations. Extensive reduction in the ability to absorb vitamin A was found to characterize pancreatic fibrosis and celiac disease. A review of the individual

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RECENT WORK IN AGRICULTURAL SCIENCE[1]

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The chemical composition of maturing New York State grapes, Z. I. KERTESZ (*New York State Sta. Tech. Bul. 274 (1944), pp. 13, illus. 1*).—The pH, acid content, specific gravity, and sugar content of several varieties of grapes grown in four districts in New York State were determined, together with the total soluble solids content of the juice expressed from the grapes as measured by a hand refractometer. From these data the sugar-acid ratio and the difference between the total soluble solids content and the true total sugar content were computed.

None of these characteristics appeared suitable to define the maturity of grapes of any given variety. Seasonal variations and differences due to location were shown to be much larger than those which occur between grapes not fully ripe and those which have attained full maturity.

The hand refractometer was found to be an instrument useful in determining the total soluble solids content of the juice pressed from grapes. It was shown to give results practically identical with those obtained by the Balling hydrometer. Correction factors for the estimation of the approximate true sugar content from the proportion of total soluble solids content in several important varieties of grapes are given.

Studies on the fractionation of zein, R. A. GORTNER and R. T. MACDONALD. (Minn. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 4, pp. 324–333, illus. 1*).—The authors describe a method of fractionating zein in methyl cellosolve solution by addition of water wherein several fractions have been obtained. One of these fractions (Fraction A, thrown down by addition of 31 percent of water by volume) was subjected to a process of refractionation which resulted in a further set of subfractions.

These experiments indicated two types of protein in zein. Type 1, hydrophobic, is precipitated as a compact coagulum. Type 2, hydrophilic, is not precipitable by water but forms a stable suspension when thrown out of clear solution. These two zein proteins were found to differ markedly in their total nitrogen content. Optical rotations of four of the zein fractions indicated at least three components. Their osmotic pressures indicated considerable variation in their molecular weights. These results, together with information obtained from peptization studies and from the weights of individual fractions obtained in the original separation, led to the conclusion that in zein: (1) 65 percent of the total protein consists of a fraction of molecular weight 45,000; (2) 25 percent of the total protein is a fraction of molecular weight 30,000; and (3) 10 percent of the total protein is a fraction of molecular weight 23,350. The third protein fraction is of type 2, whereas the others are of type 1.

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[1] **The publications abstracted in these columns are seldom available for distribution by the Office of Experiment Stations. In general, application should be made to the Office of Information of the U. S. Department of Agriculture, Washington 25, D. C., for publications of the Department; to the directors of the State agricultural experiment stations, as listed on page 3 of the cover of this issue, for publications of the several experiment stations; and to publishers of books and journals for material issued by them. Microfilms and photostatic copies, the latter legible without magnifying equipment, may be purchased from the Library, U. S. Department of Agriculture, Washington 25, D. C. Rates and other details are explained in a previous issue (E. S. R., 87, p. 324).**

A comparative study of the development of amylases in germinating cereals, E. KNEEN. (Nebr. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 4, pp. 304–314*).—β-Amylase was found in relatively high concentrations in ungerminated barley, wheat, and rye and in much less quantity in oats. The method used was not sufficiently sensitive to detect this enzyme in ungerminated maize, sorghum, or rice. From one third to one half of the total (papain-extractable) amylase was readily extracted by dilute calcium acetate solution. All the ungerminated samples had α-amylase activity but in relatively minor degree.

Germination of all the cereals led to a pronounced increase in α-amylase activity. The β-amylase of barley, wheat, and rye became more readily extractable. The β-amylase activity of germinated rice, though low, could be evaluated, but the quantities of this enzyme in germinated oats, maize, and sorghum were below the sensitivity of the customary methods. The small quantity of β-amylase present in oats largely disappeared during the germination process. When "absolute" changes in amylase activities were calculated for all the samples, it became apparent that in barley, wheat, and rye, a marked loss of β-amylase occurred during germination. Temperatures normally considered desirable for malting wheat inhibited sorghum germination. The significance of this relationship in a comparison of amylase development during the germination of different cereals was pointed out.

Industrially, the availability of cereal preparations having almost any desired combination of α- and β-amylase may have some significance. A malt having high α-amylase activity and practical freedom from β-amylase could be prepared from sorghum, and one having both α- and β-amylase from barley. The ungerminated barley itself provides a source of β-amylase relatively free from the α form.

Production of starch from wheat and other cereal flours, R. J. DIMLER, H. A. DAVIS, C. E. RIST, and G. E. HILBERT. (U. S. D. A.). (*Cereal Chem., 21 (1944), No. 5, pp. 430–446, illus. 5*).—As a basis for the production of starch from flour, conditions have been established for the essentially complete dispersion of the protein of wheat flour, without materially affecting the starch, by treatment with dilute aqueous sodium hydroxide. Two representative procedures, centrifuging and tabling, were used for starch separation. The alkali process, as used for wheat flour, was applied also to barley, rye, oat, corn, sorghum, and rice flours. These raw materials, under the conditions used, were not as satisfactory as wheat flour.

The tabling process yielded a prime-quality starch fraction, equivalent to 70–80 percent of the starch in the wheat flour. The remainder of the starch is recovered as a lower-quality fraction of low protein content (0.4–0.7 percent) and suitable for certain conversion or fermentation uses. The centrifuging process isolated all the starch of the wheat flour in a single fraction having a protein content of 0.4–0.6 percent. Included in this product are other alkali-insoluble solids which reduce the purity of the starch to between 94 and 98 percent.

The recovered byproduct wheat protein has a purity of 70–90 percent and constitutes 50–80 percent of the flour protein.

Gelatinization studies upon wheat and other starches with the amylograph, C. A. ANKER and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 5, pp. 335–360, illus. 5*).—Response of the amylograph to variations in the load applied to the viscosity-registering device was essentially linear. Wheat starch suspensions gelatinized in the amylograph from initial temperatures above 45° C. gave markedly higher peak viscosities than corresponding suspensions gelatinized from lower initial temperatures. The precision of the measurement is satisfactory. The amylograph appears to provide a convenient means of investigating the pasting properties of starches from various sources, the relative resistance of different starches to amylases and other starch degrading agents, and the effects of different processing treatments. Caution must be observed in interpreting the maximum paste viscosity of wheat- and rye-flour suspensions as an index of relative α-amylase activity of the flours because of the influence on paste viscosity of such variables as starch content, protein content, inherent differences between starches, extent of mechanical injury, and pH.

With an increase in starch concentration, the temperature of transition and paste temperature at maximum viscosity decreased, the maximum paste viscosity increased, and the rate of decrease in viscosity after the maximum became greater. When the logarithm of the maximum viscosity was plotted against the logarithm of the starch concentration, a straight line resulted for all starches investigated (corn, potato, and wheat). This relation implies that starch swelling is a first-order process while granule disintegration is a process of the second or of a higher order.

Stored and damaged wheats for starch production, M. M. MACMASTERS and G. E. HILBERT. (U. S. D. A.). (*Cereal Chem., 21 (1944), No. 4, pp. 258–266*).—Wheat stored for 3–15 yr. in a cool, dry, well-ventilated place in the laboratory or in farm bins was found to be suitable for starch production. Recovery of starch seemed to decrease somewhat as the wheat aged, but so far as determined, the properties of the starch were not found to be altered. Common types of damage to wheat, other than severe heating, were shown not to unfit it for starch production. A few types of damaged wheat yielded starch having a slight off-odor. Only in badly heat-damaged wheat were the properties of starch found to be modified.

The effect of temperature differences on some mixogram properties of hard red spring wheat flours, R. H. HARRIS, L. D. SIBBITT, and G. M. SCOTT. (N. Dak. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 5, pp. 374–385, illus. 6*).—Curve height and width were decreased by increasing the temperature. Dough development period was also markedly reduced by increasing the temperature except in the case of curves made with baking formula doughs at temperatures above 30° C. This appeared to be due chiefly to the low form of the mixer patterns. Varietal differences were more pronounced when the flours were mixed with the ingredients of the baking formula than when water alone was used. The effect of temperature on curve height and width was not uniform for flours representing different varieties. Dough development stage, however, varied with temperature in essentially the same manner for all varieties. The effect of temperature variations on mixer patterns differed for flour-water and baking formula doughs. Differences in protein content were less effective in changing curve properties than were temperature variations. Curves resembling those of normal protein hard red spring wheat flours may be obtained from low protein flours by making the recordings at a lower mixing temperature. An increase in the flour absorption decreased curve height, and, to a lesser extent, curve width, but the dough development stage was increased.

Effect of bran on bread baking, M. R. SHETLAR and J. F. LYMAN. (Ohio State Univ.). (*Cereal Chem., 21 (1944), No. 4, pp. 295–304, illus. 3*).—Three samples of bran were so ground that the five different granulations prepared from each ranged in average particle size from 0.06 mm. in diameter in the finest grinding to 2.66 mm. in the coarsest. These brans were superimposed at the rate of 15 percent on three different bread flours and the resulting mixtures baked, in a slightly modified American Association of Cereal Chemists procedure.

The effect of the addition of bran on loaf volume varied with the different flours, but the three brans produced similar results. A high negative correlation between loaf volume and bran-particle size was found. At the level used, coarse bran caused a very significant decrease in loaf volume, while the finest granulations caused a barely significant increase in loaf volume when compared to the corresponding control loaves. Bran contains a water-soluble substance which when added to white flour doughs increases loaf volume. Water-extracted bran decreased loaf volume to about the same extent as did ground cellophane when added to flour at the same stage of granulation. The results indicated that bread of good volume and texture can be produced from flour containing finely ground bran.

An instrument for determining the compressibility and resistance to shear of baked products, Y. F. Combs (*Cereal Chem., 21 (1944), No. 4, pp. 319–324, illus. 3*).—Compression is effected by a circular disk made small enough to cover the more uniform central portion of the slice without covering any of the firmer area close to the crust. This disk is united by a ball-and-socket joint to a vertical sliding rod carrying a platform at its top. A flask placed upon the platform receives lead shot from a receiver controlled by a solenoid-operated valve so connected that the solenoid current is cut off and the valve permitted to close when the compression disk has been forced down through a fixed distance. This fixed depression is indicated by a magnifying lever needle traveling over a graduated sector. The weight of the shot required to effect the fixed degree of compression is added to the known weight of the flask, platform, shaft, and compression disk to give the total weight causing the depression. A frame carrying three wires may be substituted for the compression plate to permit measurement of shear resistance.

Correlation between chemical structure of some organic compounds and their action as flour improvers and as inhibitors of proteolytic enzymes, E. Elion (*Cereal Chem., 21 (1944), No. 4, pp. 314–319*).—Organic compounds, whether aliphatic or cyclic, which contain the group ·C(OH) : C(OH)·CO., were found to act as inhibitors of papain. Examples of such organic compounds, some with strong reducing properties, are given and they were found to act in a manner similar to that of ascorbic acid. Such compounds also act as flour improvers, although their use as such may be impossible because some of these compounds may prove poisonous and some have an undesirable effect on color or other bread properties.

The growth of bacteria with a constant food supply.—I, Preliminary observations on Bacterium coli, R. C. Jordan and S. E. Jacobs (*Jour. Bact., 48 (1944), No. 5, pp. 579–598, illus. 3*).—The authors cultivated *B. coli* in an apparatus which permitted rigid control of temperature, pH, aeration, and culture volume, and also allowed food to be supplied at any desired rate by means of an automatic syringe mechanism. They made determinations of total and viable cell populations and constructed growth curves.

At each of the two rates of constant food supply used, an initial period in which the total and viable counts were both increasing was followed by a steady phase in which the viable counts remained constant or decreased slightly while the total cell counts steadily increased. When, in experiments which had reached the steady phase, the food supply was suddenly doubled, a second phase of cell multiplication similar to that in the initial period began and was succeeded by a second steady phase. When, during the first steady phase, the food supply was suddenly stopped, the total cell population remained constant but the viable cells decreased to a constant low level. Approximate calculations of the quantity of food used in the formation of a new *B. coli* cell and in maintenance of a cell apart from reproduction indicated 1.1×10^{-9} mg. and 0.4 to 0.5×10^{-9} mg. per 25 hr. of a dehydrated broth, respectively.

The bacterial oxidation of corn oil, J. O. Mundt and F. W. Fabian. (Mich. Expt. Sta.). (*Jour. Bact., 48 (1944), No. 1, pp. 1–11, illus. 1*).—The authors found the Warburg apparatus to be a dependable, timesaving instrument in determining the ability of bacteria to take up oxygen in the presence of fats and oils. It yielded information not made available by culture or by chemical tests.

Of 32 cultures of commonly occurring soil and water bacteria studied, it was found that 25 showed an increased rate of utilization of oxygen while only 6 evinced the ability to dehydrogenate the oil. To *Aerobacter aerogenes* (the only species reported to date to be fat-oxidative and nonlipolytic) may be added *Alkaligenes faecalis, Sarcina lutea, Micrococcus aurantiacus, M. flavescens, M. cinnabareus, Flavobacterium arborescens, Phytomonas tumefaciens,* and *Pseudomonas mephitica.* On prolonged incubation, the oxidative changes of lipides brought about in flasks containing bacteria are indistinguishable from strictly nonbiological changes, as shown by determinations of the various fat constants. A concentration of 0.85 percent NaCl brought about a noticeable inhibition in the rate of respiration for three of six species of *Pseudomonas.* A concentration of 2.5 percent inhibited the respiration of all species except *P. fluorescens,* in the presence of oil, to a point below that of endogenous respiration in saline-buffer suspension. The respiratory rate was lowered by a decreased pH, but a comparatively low pH (about 5.0 to 5.6) was required to bring about a noticeable inhibition. Two anti-oxidants, hydroquinone and a commercial preparation, did not prevent bacterial respiration in the presence of oil in the concentrations used.

An alcohol oxidation system in streptococci which functions without hydrogen peroxide accumulation, E. C. GREISEN and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Bact., 48 (1944), No. 5, pp. 515–525, illus. 3*).—The authors showed that *Streptococcus mastitidis,* a homofermentative lactic acid organism lacking the usual hemin catalysts, oxidizes ethyl alcohol to acetic acid in the presence of air without added carriers. The rate of oxidation is stimulated several fold by the addition of methylene blue. The oxidation requires but 1 mole of oxygen per mole of alcohol, and hydrogen peroxide does not accumulate in the absence of added carriers. When semicarbazide is added as an aldehyde fixative, alcohol is oxidized more rapidly with the utilization of 0.5 mole of oxygen per mole of alcohol. Aldehyde is oxidized to acetic acid by 0.5 mole of oxygen. In the absence of oxygen, aldehyde is dismutated to acid and alcohol.

The author's experiments further show that the alcohol oxidation is inhibited by M/100 iodoacetate, but neither the aldehyde oxidation nor the dismutation is thus inhibited. Sodium cyanide does not inhibit the oxidation at the concentration effective against the usual hemin systems but does partially inhibit at M/100.

Citric acid fermentation by streptococci and lactobacilli, J. J. R. CAMPBELL and I. C. GUNSALUS. (Cornell Univ.). (*Jour. Bact., 48 (1944), No. 1, pp. 71–76*).—Several species of homofermentative lactic acid bacteria, cocci, and rods were shown to utilize citric acid as an energy source for growth in the absence of fermentable carbohydrate. Fermentation balances of growing cultures of representative strains of enterococci, *Lactobacillus delbrueckii,* and *L. casei* showed the main products in neutral cultures to be acetic acid and carbon dioxide, formic and lactic acids accounting for most of the remaining carbon. Traces of acetylmethylcarbinol and ethyl alcohol were also formed. With citric acid as substrate, the fermentation products of the homofermentative lactic acid bacteria show several similarities to those formed by members of the *Leuconostoc* and *Aerobacter* genera.

It is suggested that oxidized substrates, such as citric acid, will give more information as to the potentialities of the homofermentative organisms than will the more conventional hexoses.

A chemical and immunological study of the capsular polysaccharide of Clostridium perfringens, M. H. SVEC and E. MCCOY. (Univ. Wis.). (*Jour. Bact., 48 (1944), No. 1, pp. 31–44*).—The authors describe a method of isolation of the capsular polysaccharide of *C. perfringens* involving cultivation of the organism in large volumes of a synthetic medium, high speed centrifugation, reduction to less than one-eighth of the original volume under reduced pressure at 22°–27° C., removal of an ammonium sulfate precipitate, ultrafiltration of the filtrate from this precipitate, further concentration, removal of ammonium sulfate by dialysis, precipitation by methyl alcohol, flocculation of the precipitate with a very small quantity of acetic acid, and washing of the precipitate with absolute methyl alcohol. They obtained 3.5128 gm. polysaccharide from 25 l. of culture. Analyses of preparations secured by variations on this method were made.

Antigenicity of three of these preparations was established. Precipitation and agglutination tests indicate a common capsular polysaccharide for most, if not all, strains of *C. perfringens*. It is recommended that, if possible, serums for agglutinations be prepared by injection of polysaccharide adsorbed upon some inactive carrier to avoid, whenever practicable, the use of whole cells as antigens. Agglutination reactions with such serums are suggested as aids in diagnosis of *C. perfringens* in gas gangrene, or in classification of this organism, with the reservation that the procedure indicates nothing concerning the fermentative or toxigenic capacities of the strain under consideration.

Ashing of egg whites and yolks and the determination of their iron content, S. L. Bandemer, J. A. Davidson, and P. J. Schaible. (Mich. Expt. Sta.). (*Poultry Sci., 23 (1944), No. 5, pp. 437–440*).—The whites were placed in folded filter papers within crucibles and charred over Meeker burners. Magnesium chloride was then added and the ashing was completed in a muffle furnace overnight at 600° C. Difficulties encountered were attributed to the high ratio of phosphorus to base in the white, as when various phosphorus compounds were added to iron solutions in the proportion found in egg white the ash fused and the iron was incompletely recovered. If magnesium chloride was added before the material was placed in the muffle furnace, no fusion occurred and the iron was completely recovered. With the small samples of yolk ashed, no difficulty was experienced. For larger yolk samples, the use of folded filter paper in the crucible was found advantageous.

An aid in ashing certain materials, S. L. Bandemer and P. J. Schaible. (Mich. Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 6, p. 417, illus. 1*).—For substances that are finely ground, contain oil or fat, or have a high phosphorus-to-base ratio, the method above described as suitable for egg white is suggested.

Carbon dioxide generator for the Dumas method of determining nitrogen, H. A. Pagel. (Univ. Nebr.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 5, pp. 344–345, illus. 1*).—The author finds the generator here described to have as its advantages a generating capacity of over 650 l. of gas, exclusive of the amount wasted during the initial evacuation to remove air impurities; the bicarbonate solution is automatically agitated whenever more gas is generated, whereby stratification is avoided; any traces of residual air in the acid reservoir are effectively swept out whenever the gas is used; no special safety precautions are necessary during the initial evacuation or later operation; and since the gasometer (with a flexible glass extension) is an integral part of the generator, the two rubber couplings ordinarily used are eliminated from the train. The chief disadvantage is that certain parts (particularly the generator bottle, acid reservoir, and gasometer) must be rigidly supported to prevent breakage due to possible misalignment after the parts are assembled. The apparatus is, however, safely portable when mounted on a suitable platform.

Rapid digestion method for determination of phosphorus, D. W. Bolin and O. E. Stamberg. (Idaho Expt. Sta.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 5, p. 345*).—The authors have shown that the presence of molybdenum in a perchloric-sulfuric acid mixture markedly increases the rate of oxidation of organic matter. The use of molybdenum in small quantities as catalyst proved not to interfere with the quantitative colorimetric determination of phosphorus as in the Fiske and Subbarow method (E. S. R., 55, p. 310). Hence a rapid method was developed for determining phosphorus by perchloric-sulfuric acid digestion (E. S. R., 75, pp. 153, 156) in the presence of molybdenum followed by colorimetric analyses. Results of phosphorus determinations on feeds digested with perchloric-sulfuric acid mixture in the presence of molybdenum as a catalyst are presented and compared with results obtained by the official ashing method. Digestion of the sample to a clear solution free from charred residue could usually be effected in a few minutes. When samples were of 0.5 gm. or less a set of six samples could be digested in less than 10 min. The examples given are of analyses of feeds and their component materials.

Colorimetric determination of 2,4-dinitroanisole, M. S. SCHECHTER and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 5, pp. 325–326, illus. 2*).—Use was made of the purpuric acid reaction, in which potassium cyanide reacts with *m*-dinitro compounds to give red-brown to violet colors. The reaction with 2,4-dinitroanisole is presumed to be similar to that for 2,4-dinitrophenol, which gives 2-hydroxylamino-3-cyano-4-nitrophenol. A reaction of the dinitroanisole in which it is acted upon by concentrated sodium hydroxide in acetone solution to give a violet color was found to be too sensitive for samples containing as much as 2 percent of 2,4-dinitroanisole, but it is held that this reaction would certainly be useful when very small quantities of 2,4-dinitroanisole had to be determined.

Colorimetric determination of 1-chloro-2,4-dinitrobenzene as an impurity in 2,4-dinitroanisole, M. S. SCHECHTER and H. L. HALLER. (U. S. D. A.). (*Indus. and Engin. Chem., Analyt. Ed., 16 (1944), No. 5, pp. 326–327, illus. 1*).—The method described is based upon the reaction of 2,4-dinitrochlorobenzene with pyridine in which the ring is opened to give a 2,4-dinitrophenylimine of an open-chain unsaturated aldehyde. This aldehyde, in the enol form in which it exists in alcoholic alkaline solution, is of an intense violet color. The intensity of this color is determined in a photometer with the aid of a [Wratten?] No. 58 light filter.

A colorimetric determination of nicotinic acid, A. E. TEERI and S. R. SHIMER (*New Hampshire Sta. Sci. Contrib. [92] [1944], pp. 307–311*).—This has been abstracted (E. S. R., 91, p. 637) from the original.

In line 7 of the second paragraph of that abstract, the numerical expression of wavelength should read "400 mμ."

Adsorption of riboflavin by lactose, A. LEVITON. (U. S. D. A.). (*Indus. and Engin. Chem., 36 (1944), No. 8, pp. 744–747, illus. 1*).—In continuation of earlier work (E. S. R., 90, p. 442) dealing with the influence of concentration on the adsorption of riboflavin by lactose, the present study shows that temperature is very important, since temperature as well as lactose concentration influences the critical concentration of riboflavin below which no adsorption occurs. This critical concentration was found to increase markedly with temperature increase, so that by choosing a temperature sufficiently high it was possible to crystallize a considerable portion of the lactose free of riboflavin. Then by lowering the temperature it was possible to crystallize another batch of lactose containing adsorbed riboflavin in good yields. Tables are given from which the plant operator may choose operating conditions with respect to concentration and temperature for the controlled preparation of adsorbate in the yield and concentration desired. As a basis for these tables, concentrations and temperatures were studied that covered the ranges encountered in the manufacture of adsorbates from grain curd casein.

Some factors affecting the determination of riboflavin by the fluorometric method, A. HOFFER, A. W. ALCOCK, and W. F. GEDDES. (Minn. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 6, pp. 515–523*).—The reference assay procedure used was essentially that of Andrews (E. S. R., 91, p. 506) and involved utilization of a 1-gm. sample and adsorption of riboflavin from the extract (following $KMnO_4$ and H_2O_2 treatment), using Florisil as the adsorbent. The effect of sample size was studied by observing the adsorption from 50 cc. aliquots of extract (100 cc. total value) prepared from 3, 6, and 10 gm. of second-clear flour and passed in succession through a series of four adsorption tubes containing 1.1 gm. Florisil.

In a parallel series of experiments different volumes of extract were each passed through a series of four adsorption tubes. As the sample size increased a smaller fraction of the total riboflavin of the extract was adsorbed on the first tube and as the size of the aliquot increased more and more riboflavin escaped adsorption on the first tube. With the larger samples (6 and 10 gm.) the proportion of the riboflavin adsorbed when adsorption was apparently complete was only about 50 percent of that observed for the smaller samples. These results indicated that increasing the size of sample decreased the efficiency of extraction and also decreased the adsorptive efficiency of the Florisil. Riboflavin adsorbed on extraction residues went into solution upon dilution. Different lots of Florisil exhibited differences in adsorptive efficiency, but even the less efficient Florisils adsorbed pure riboflavin quantitatively from aqueous or buffered acid solutions; the lowered efficiency with flour extracts as sample size increased suggested, therefore, that increasing quantities of impurities were present in the extract.

Taking this factor into account, suggestions are made for carrying out recovery trials and for checking the adsorbing qualities of Florisil. Native riboflavin adsorbed on Florisil could be removed by washing, indicating the necessity for using the minimum of washing water. "The use of Corning filter 511 alone for the incident light proved unsatisfactory owing to the photosensitivity of riboflavin in pyridine eluates and to the difficulty of finding the blank values for patent flour eluates. The use of a combination of Corning filters 511 and 038 for the incident light with 351 for the fluorescent light eliminated these difficulties as sources of important errors."

A rapid method for the determination of riboflavin in wheat and wheat products, A. Hoffer, A. W. Alcock, and W. F. Geddes. (Minn. Expt. Sta.). (*Cereal Chem., 21 (1944), No. 6, pp. 524–533*).—The rapid method described eliminated adsorption on Florisil and the use of pyridine, and involved extraction of the riboflavin by heating the sample in acid KCl solution for 30 min. at 70° C. From the supernatant solution, separated from the residue by centrifugation, an aliquot was taken for treatment with $KMnO_4$ and H_2O_2 for removal of impurities. Fluorescence, read after the gas bubbles had cleared, was measured before and after the addition of the riboflavin standard to the aliquot and again following treatment with sodium hydrosulfite to obtain the blank reading. Results of assays of flour, mill feeds, and bread by the rapid method agreed closely with those obtained by the fluorometric procedure described above, which was used as a standard of reference. For both the rapid and reference methods the absolute error increased, while the percentage error decreased, with increasing riboflavin content. The duplicate error for the rapid method was lower than for the reference method. The rapid method worked well with enriched flour and bread, mill feeds, and wheat, and in spite of low fluorescence readings gave satisfactory results for unenriched patent flours. It is considered applicable to other materials but not to green plant tissues. A single determination by this method required from 60–70 min.

Simplification of the thiochrome method for thiamine determination, G. W. Schiller (*Cereal Chem., 21 (1944), No. 6, pp. 544–548*).—The procedure described effects a considerable saving of time by elimination of the zeolite adsorption procedure. The method was found applicable without variation in procedure to all types of milled products, and no correction factors were necessary. The sample, varied in weight depending upon the expected thiamine content, is subjected to warm acid hydrolysis followed by adjustment of pH and hydrolysis with takadiastase. The extract obtained upon filtration is treated with KCl crystals and then subjected to oxidation with alkaline ferricyanide, the alkali being added after the ferricyanide, following which the fluorescent material is extracted with isobutanol; fluorescence readings are made directly from this extract (after drying with anhydrous sodium sulfate) in the fluorophotometer previously set with the quinine sulfate standard. The reading obtained is proportional to the amount of thiamine in the sample plus any nonthiamine fluorescent impurities. The latter are corrected for in readings from the blank determination carried out with the unknown subjected to all treatments except that of oxidation. The thiamine content is calculated, according to the equation given, with reference to readings obtained on a thiamine control solution subjected to the various treatments in the procedure. The accuracy of the simplified method, as shown by collaborative analyses of 127 samples of various cereal products, compares favorably with that of the regular thiochrome method.

Properties of paraffin relating to microtechnique, W. T. DEMPSTER (*Mich. Acad. Sci., Arts, and Letters, Papers, 29 (1943), pp. 251-264, illus. 5*).—"Unadulterated paraffin, when congealed in an embedding mass, is composed of contiguous needlelike crystalline aggregates, each of which consists of a central core and many concentric lamellae made of alternate depositions of hard and soft paraffin. This crystalline mass forms the matrix for embedded tissue. Except for the most peripheral layer, rapid cooling of a mass does not materially reduce the size of crystals. If each crystal is in intimate contact with other crystals so that no interstices occur, the paraffin is clear and homogeneous, and good microtome sections may be made. Mottling or 'crystallization' is a defect due to air spaces between crystals, which makes crystals visible grossly. Suggested procedures that eliminate or reduce mottling are outlined. Within tissue interstices typical needle structure of paraffin is supplanted by irregular lamellation, but within cells the paraffin is amorphous. Cooling curves are presented to show characteristics of a group of typical embedding paraffins. The literature on paraffin transition points is cited in relation to a discussion of the plastic behavior of paraffin. Above and below a characteristic temperature for each paraffin the mode of response to a distorting force becomes altered. This temperature, for standardized conditions of testing, may be called the plastic point, and it may be used as a measure of the relative hardness of paraffin. The sectioning behavior of paraffin is more closely related to the plastic point of a sample than to the melting point."

Un nouveau micromanipulateur hydraulique, M. CAILLOUX (*Rev. Canad. Biol., 2 (1943), No. 5, pp. 528–540, illus. 7; Eng. abs., pp. 539–540*).—The new type of apparatus described and illustrated is composed of two distinct units—the micromanipulator and the receptor which holds the microtools. The advantages reported are: All movements of the tools are controlled by a single knob; the response is positive, without lag; it is exceedingly refractory to vibrations; the receptor can be so placed that the microtool seems to be a continuation of the lever on the manipulator; the ratio of demultiplication can be varied at will; the apparatus does not need previous training for expert application; and in its manufacture very few parts need be machined with great precision.

AGRICULTURAL METEOROLOGY

Weather predetermined by solar variation, C. G. ABBOT (*Smithsn. Misc. Collect., 104 (1944), No. 5, pp. 44, illus. 24*).—From revised daily solar-constant values studied to select dates during 1924–39 when brief sequences of rise and fall of the sun's emission of radiation occurred, a table of 440 sequences was made; this table is divided into cases of rising and falling sequences, and each class is then subdivided into 12 groups for the 12 mo. of the year. The average length per sequence is 4 days, and the average amplitude of change per sequence is 0.7 percent of the solar constant of radiation. Corresponding to each individual case of rising and falling sequences, the departures from normal temperatures and barometric pressures were tabulated for a number of widely separated stations; these tabulations ran from 5 days before to 14 (sometimes 20) days after the zeroth day of the sequence. Mean values for successive days were computed (method shown by photographs) for every station and every month, and graphs indicate the average marches of the weather elements attending rise and fall of the solar constant. The main results were: Solar changes affect weather for about 20 days; produce major effects on temperature which are generally opposite for rising and falling solar activity; and may alter temperatures by 10°–15° F. as much as 10 days after the zeroth day, depending on whether the solar radiation has increased or decreased.

These results were confirmed and buttressed by a similar treatment of the observation of calcium flocculi over the sun's disk made at the Observatory of Ebro, Spain, 1910–37; the solar-constant curves and the solar-flocculi curves for temperature departures at Washington, D. C., for all 12 mo. from the day —3 to the day +14 gave a correlation coefficient of 59.7 ± 1.9 percent. It is shown that on the average the weather influence begins 4 days before the solar-constant change begins and 6 days before the areas of solar flocculi are affected. This leads to the hope that some other solar phenomenon may be found that changes simultaneously with the weather effects and is available as a basis for a long-range detailed weather forecast of upward of 2 weeks. Curves are given to illustrate and clarify these and other results. From the combined results of the Smithsonian solar-constant work and the Ebro flocculi photography, solar forecasts were prepared for 201 days of the years 1911, 1915, 1917, and 1935 and compared with the events; the results give fair promise that useful forecasts could be made if daily determinations were available to record all solar changes.

Previously published data show the variation of the monthly means of the solar constant of radiation, its analysis into 14 regular periodicities, and a prediction of solar variation for 1939–45. In the present study the prediction is compared with preliminary monthly mean solar-constant values from Mt. Montezuma, 1939–45; good verification is shown. This led to the expectation of interesting features of weather in 1944, 1945, and 1946; prediction indicated low solar-constant values similar to those of 1922–23 when unusual weather was experienced. Since the period of 273 mo. is the approximate least common multiple of the 14 periodicities in solar variation, and also of the 11⅓-yr. sunspot cycle, weather features should tend to repeat in cycles slightly less than 23 yr. long. Examples are given confirming the 23-yr. cycle in weather features, which has been reduced to a rough rule-of-thumb practice, viz, the mean of the departure from normal temperatures and precipitations of April 46 yr. before, and of February 23 yr. before, indicates the departure for January of the year predicted—and similarly for succeeding months. By employment of this method, useful results for 96 mo. are quoted for Eastport, Me., and for 12 stations scattered over New England; for Eastport 84 mo. out of 96 and for New England 803 out of 1,144 yielded reasonably useful predictions. The individual effects of the 14 periodicities on weather are traced. For shorter periods (8–21 mo.) changes of phase in weather effects of solar variation occur for different seasons of the year.

With seasonal phase changes in weather responses eliminated, it is shown that the period of 8⅛ mo. has been strongly marked at Copenhagen, Vienna, and New Haven since 1800; similar results are in manuscript for other solar periods. Hence it is inferred that in the sun's emission of radiation the 14 periodicities have persisted with unchanged phase for at least 140 yr. The individual effects of the 14 periodicities—and in addition of the sunspot cycle—are computed from records of precipitation at Peoria, Ill., 1856–1929; these are synthesized for 1930–43 and compared to the events. Improvements seem possible by adjusted periods and consideration of terrestrial influences. Attention is drawn to a period of 27.0074 days in Washington precipitation (E. S. R., 91, p. 640); results of comparisons of its indications with the events are given through 1943, and a forecast of days of high precipitation for 1944 is tabulated—with verification for the first 4 mo. of that year excepting April.

Precipitation prospects, 1943–47, for Ohio and near-by States, E. L. MOSELEY (*Mich. Acad. Sci., Arts, and Letters, Papers, 29 (1943), pp. 23–29*).—This is a general discussion of correlations of tree-ring measurements with amounts of annual precipitation and their use as a basis for long-range forecasts of precipitation, with presentation of specific figures for various periods of time and the conclusion that "further data either from tree rings or from unpublished records of rainfall in the middle of the last century may make possible more precise statements regarding probable future rainfall in different areas."

Weather headlines in Ohio, G. W. MINDLING (*Ohio State Univ. Studies, Engin. Ser., Bul. 120 (1944), pp. 124+, illus. 2*).—This compilation of climatological data through 1944 for Ohio—coming from various sources and in some cases going back to the last quarter of the eighteenth century—covers the "head-lines" in cold weather, dry periods, heavy rains, floods, frosts, hailstorms, ice storms, notable snowstorms, nontornadic windstorms, tornadoes, warm weather, and miscellaneous incidents. Tabulated State averages over long periods of years include annual precipitation and snowfall, percentages of normal precipitation by seasons, and temperatures, precipitation, and snowfall by months.

Dommages causés aux plants de tabac par le vent et moyens de les prévenir [Wind damage to tobacco plants and means of preventing it], F. GODBOUT and O. BEAUDOIN (*Quebec Soc. Protect. Plants Rpt., 28 (1936–43), pp. 66–67*).

SOILS—FERTILIZERS

A soil map of Australia, J. A. PRESCOTT (*Austral. Council Sci. and Indus. Res. Bul. 177 (1944), pp. 15+, illus. 1*).—Along with a map of the major soil zones of Australia, this bulletin presents a discussion of the various regions and the environmental conditions prevailing.

Radioactivity of New Zealand soils and rocks, E. MARSDEN and C. WATSON-MUNRO (*New Zeal. Jour. Sci. and Technol., 26 (1944), No. 3, Sect. B, pp. 99–114, illus. 1*).—The alpha ray activities of various soils and rocks in New Zealand, Australia, and Great Britain are reported. The results show that soil radioactivities are dependent upon the rocks from which they are derived rather than the type of soil. Basalts, andesites, rhyolites, and limestones gave low readings, while granites and graywackes gave high readings of alpha ray activities in ionization currents × 10^{18}/cm.^{2}. These results were confirmed in the case of graywackes and basalts by observations with the gamma ray chamber. The gamma ray activity of potassium salts in the samples influenced the results considerably.

A study of the centrifuge moisture equivalent as an index of the hydraulic permeability of saturated soils: A progress report, H. B. ROE and J. K. PARK. (Minn. Expt. Sta.). (*Agr. Engin., 25 (1944), No. 10, pp. 381–385, illus. 5*).—The centrifuge moisture equivalent, M_{eq}, is generally more readily and quickly determined than is the hydraulic permeability (k_s in Darcy's law of fluid flow through porous media, $v = k_s b_f/L$). The authors sought a usable empirical relation between corresponding k_s and M_{eq} values, because numerical values of this coefficient are thus far available for only a negligible number among thousands of soils of differing character, the equipment and knowledge of procedures for making such determinations exist at relatively few places, and the determinations often take considerable time. This study is limited to saturated soils and to tests made on laboratory-prepared samples rather than on undisturbed field samples. A form of variable head permeameter constructed for the direct determination of k_s is described and shown in a diagrammatic drawing and photograph. Derivation of an equation for the computation of the results, from which the final value of the head is eliminated, is shown.

The experimental results showed that there is no mathematical relationship between moisture equivalent and hydraulic permeability sufficiently reliable for direct application to practical problems. There was indicated, however, a general trend sufficiently clear to serve as a guide to the judgment in selecting the probable range of k_s values for a given soil whose moisture equivalent is known, even though the laboratory determination of the exact k_s cannot readily be carried out.

Permeability measurements on disturbed soil samples, M. FIREMAN. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 5, pp. 337–353, illus. 5*).—Some of the factors which influence laboratory permeability measurements are discussed briefly. These are: Method of determination; shape and size of permeameter; water outlet; soil retaining screens; water-head controls; hydraulic gradient; fluids; viscosity; temperature; direction of water flow; entrapped air; texture; volume weight, and water content during packing; effect of sieve size; packing technic; wetting technic; variability of permeability with time; electrolyte concentration; composition of water; and replication.

The author finds that laboratory studies are useful where it is not practical or economically feasible to conduct field trials on soil reclamation and movement of water through soils; and that disturbed soil samples can be used advantageously to study the relative changes in percolation rate brought about by specific chemical and physical soil treatments.

Effect of entrapped air upon the permeability of soils, J. E. CHRISTIANSEN. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 5, pp. 355–365, illus. 6*).—In soils prepared for laboratory permeability determinations and wetted, some air is trapped regardless of whether the water is applied from the top, from below by capillarity, or under a head. Upward flow of water in the permeameter is no assurance of air elimination. Having once become immobilized, this entrapped air can escape only by dissolving in the water. A means of avoiding this air entrapment is to evacuate the dry soil and wet it in the absence of air.

In some soils, the method of wetting under reduced pressure greatly reduces the final permeability obtained. Entrapped air causes a large reduction in permeability compared with that of completely saturated soils. In some instances an increase of more than 30 times the previous minimum rate has been obtained with the elimination of this air. The presence of air in the soil results in permeability values being affected by variations in pressure and temperature. The increase in volume of entrapped air with increase in temperature results in a relative decrease in flow, which partly compensates for the increase in flow due to the decrease in viscosity of the water.

Physical effects of tillage in relation to plant growth (*Alabama Sta. Rpt. 1942, p. 9*).—The effect of soil tillage on plant growth has always been a difficult problem. In an attempt to determine this factor, cotton was planted in 18 experimental plots consisting of various clod mixtures or soil separates ranging in size from less than $\frac{1}{16}$ in. to 2 in. One-half of the plots received an application of surface mulch. Good stands of cotton were obtained on all plots containing clod mixtures that had not been mulched. Where mulch was used the stands were poor. Very poor stands were obtained on both mulched and unmulched plots that contained clod separates of one size only.

Soil crust formation and its relation to crop stand (*Alabama Sta. Rpt. 1942, pp. 7–8*).—Tubs containing Cecil clay loam were planted to cotton, one-half of the tubs being treated with a mixture of sugar and casein to promote bacterial growth in an attempt to find the effect of soil crust formation on crop stands. The treated tubs were found to produce poor stands of cotton and the soils had a hard crust which was very water stable.

Effect of cropping practices on runoff, soil, and fertilizer losses (*Alabama Sta. Rpt. 1942, pp. 9–10*).—The practice of using balks was found to reduce water loss

50 percent and soil loss 17 percent. However, cotton yields from balk plots were only about one-half of those from the check plots.

Stubble mulch farming in southern Idaho, H. C. McKay and W. A. Moss (Coop. U. S. D. A.). (*Idaho Sta. Bul. 256 (1944), pp. 20, illus. 12*).—The effect of straw mulch on erosion, moisture conservation, and yield of wheat under a summer fallow system was determined on a soil corresponding to the Ritzville series at the Tetonia Substation 7 miles northwest of Tetonia, Idaho. The station is located at 6,000-ft. elevation and is characterized by wide seasonal range in temperature and an average annual precipitation of 13.1 in.

Investigations covering a 4-yr. period indicated that burning straw residues is the greatest single factor contributing to erosion of cropland in the southeastern Idaho dry-farm area and that working summer fallow more than is necessary to control weeds has a tendency to increase erosion. For wheat yields and erosion control, surface utilization of straw is superior to mixing it with the surface soil or turning it completely under. Under conditions of heavy straw, burning gave a small increase in yield; but under conditions of light stubble no advantage was gained by burning The burning of stubble in all cases contributed to the erosion problem.

In connection with tillage and the effect of soil-management practices on fertility and erosion, it was found that, after initial tillage, the method of cultivating the fallow giving best results was rod weeding only when necessary. Subsurface implements leave from 90 to 95 percent of the straw and stubble on the surface. The low organic matter and nitrogen content of the surface soil of southern Idaho wheat lands strongly indicates the necessity of not only utilizing all crop residues but also of adopting crop rotations to maintain soil fertility. The success of stubble mulch tillage depends upon the timeliness and quality of operations. All initial tillage and fallow operations should be completed before the weeds and volunteer wheat have made much growth. No subsurface tillage should be undertaken during wet weather. Straw spreaders should be used on all combines.

The bulletin contains general recommendations on practices to be followed in handling crop residues, depending upon the previous yield of wheat obtained.

Contour furrows for water conservation on pasture land (*Alabama Sta. Rpt. 1942, p. 10*).—Three years' results indicated that it does not pay to contour furrow pastures on Norfolk sandy loam, which has a high infiltration rate and good subsurface drainage.

Reclaiming stripped lands in Illinois, L. A. Holmes (*Sci. Mo., 59 (1944), No. 6, pp. 414–420, illus. 7*).—An illustrated article on the extent, appearance, and methods of reclaiming strip mined land of southern Illinois. In 1941, 23,981 acres of land had been mined. It is estimated that the State contains an additional 34,840 acres of shallow coal deposits suitable to recovery by strip mining methods. Through forestation, development of pasture, recreational park areas, and game preserves, the strip mined areas may be used to advantage and will, in the opinion of the author, return a yearly profit to the owner equal to that obtained from the land prior to mining.

The influence of temperature on the microflora of the soil, J. E. Greaves and L. W. Jones. (Utah State Agr. Col.). (*Soil Sci., 58 (1944), No. 5, pp. 377–387, illus. 1*).—Samples of four soils were stored for 24 mo. at 10°, 20°, 30°, and 40° C., and at the end of 6, 12, 18, and 24 mo. were analyzed for numbers of microorganisms, accumulation of ammonia and nitrates, and total gains in nitrogen.

The greatest number of micro-organisms developed on synthetic glucose agar when the soils had been stored at 10°; the fewest after storage at 40°. The accumulation of ammonia was greatest in soils which were stored at 10° and least in those stored at 40°. This difference produced by storage was so great that it was not obliterated by incubating with dried blood for 7 days at 20° or 30°. The storage of soils for 24 mo. at 10° or 20° produced a rather persistent change in their nitrifying microflora. In two out of the four soils stored at 40°, the ability to produce nitrates had been lost. Storage of soils at 20° and 30° for 24 mo. had no significant effect upon their nitrogen-fixing powers, but storage at 40° materially reduced nitrogen fixation. When tested by the tumbler method, storage at 10° was found to reduce greatly the nitrogen-fixing powers of the soils as compared with that of similar soils stored at 20° or 30°.

New Aspergilli from soil, K. B. RAPER and C. THOM. (U. S. D. A.). (*Mycologia, 36 (1944), No. 6, pp. 555–575, illus. 6*).—Five species and one variety of *Aspergillus* isolated from southern or tropical soils are described as new. The new forms are as follows: *A. janus; A. janus brevis; A. caespitosus; A. granulosus; A. panamensis;* and *A. sparsus.*

Correlation between size and number of soil animals, M. S. GHILAROV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 6, pp. 267–269, illus. 1*).—Graphic information is presented on the relation of the size to the number of soil organisms per unit of space. The data suggest a definite regularity in the distribution of the represenative soil fauna over a unit area according to given size groups. The most numerous organisms are the ones of smallest dimensions. The author attributes this size distribution to such factors as food, water, and oxygen supply.

The chemical composition of earthworm casts, H. A. LUNT and H. G. M. JACOBSON. (Conn. [New Haven] Expt. Sta.). (*Soil Sci., 58 (1944), No. 5, pp. 367–375*).—Samples of earthworm casts and of unworked soil from several depths were collected from a cultivated field and from four forested areas and subjected to chemical and mechanical analyses.

At the time of sampling, the field soil contained approximately three casts to the square foot, averaging 2 oz. each, or 16,000 lb. to the acre. In the field soil, casts contained less exchangeable hydrogen and a lower clay content than the 0- to 6-in. layer. The casts had higher pH values and were higher in total and nitrate nitrogen, organic matter, total and exchangeable calcium, exchangeable potassium and magnesium, available phosphorus, base capacity, base saturation, and moisture equivalent. Total magnesium was about equal in all samples. Forest soil samples showed similar, but even more striking, results. Forest soil casts were higher in nitrogen, organic carbon, and exchangeable calcium, and had a higher moisture equivalent than the casts from the field soil.

These changes in composition as the result of earthworm activity are due chiefly to the intimate mixing of plant and animal remains with mineral soil in the digestive tract of the worm and to the action of digestive secretions on the mixture. That earthworms are beneficial to the soil has been established beyond a doubt. Conditions favorable to the worms, however, are at the same time favorable to plant growth, and quantitative measurements under field conditions of the part the worms play in crop production have not as yet been obtained.

Procedures for testing soils: Nomenclature and definitions—standard methods—suggested methods (*Philadelphia 2: Amer. Soc. Testing Materials, 1944, pp. 200+, illus. 96*).—This publication presents 13 American Society for Testing Materials standard methods, as well as 38 suggested procedures for investigating soil and soil mixtures. The compilation consists of the following parts: (1) Indicator tests on soils (pp. 8–58); (2) compaction and consolidation tests on soils (pp. 59–76); (3) strength tests on soils (pp. 77–124); (4) tests for soil-cement (pp. 125–138); and (5) tests for soil-bituminous mixtures (pp. 139–200).

Some modifications in the Neubauer method, W. T. MCGEORGE. (Ariz. Expt. Sta.). (*Soil Sci., 58 (1944), No. 5, pp. 389–397, illus. 2*).—In a study of certain modifications of procedure in the Neubauer seedling test (E. S. R., 53, p. 319), it was shown that both the ratio and the absolute weight and number of seedlings must be maintained at 100: 100, but in availability studies informative data can be obtained by modifying the procedure to use lower weights of soil. The Neubauer test, like the chemical analysis of a soil, is an empirical test because the conditions must be closely adhered to in order to obtain quantitative values. When the Neubauer test is modified by comparing uptake of nutrient elements by rye and by other seedlings the data are confused by lack of uniformity of seed. There is, however, strong evidence that the availability as measured with rye seedlings is applicable to many other crops.

Fertilizer recommendations for Mississippi, 1945, C. DORMAN (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 12, pp. 1, 2*).—The five grades of mixed fertilizers available for 1945 are considered in relation to crop and soil needs for the most efficient wartime production. Fertilizer recommendations are presented for the various soil areas of the State.

Lime and 0–8–6 produce vetch nitrogen for corn and cotton in Brown loam soil areas, H. B. VANDERFORD (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 12, p. 8*).—Grenada silt loam, a Brown loam soil, was used in greenhouse, laboratory, and field studies to determine the most desirable lime level for legume growth. Using soybeans, Korean lespedeza, and sweetclover, it was found that pH 7 was the most desirable level.

Fertilizer practices for cotton on soils of Tallahatchie, J. PITNER (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 12, p. 2*).—Results of soil management studies on Minter fine sandy loam, in the vicinity of Greenwood, Miss., show that increases in yield of seed cotton were obtained by applying commercial fertilizer in addition to growing and turning under vetch. Nitrogen was found to be the fertilizer element most badly needed.

Contribution to the theory and practice of use of nitrogen fertilizers, M. C. ČAJLACHJAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 9, pp. 387–390, illus. 2*).—The author discusses the common belief in regard to nitrogen fertilizers causing an increase in vegetative growth and tending to delay the seed-forming processes in plants. It is pointed out that there are certain plants where this may not be the case. Experiments with millet, perilla, lupine, and lettuce, indicate that these plants should be referred to as crops that can be controlled by means of nitrogen application. The use of nitrates is also suggested as advisable in the case of buckwheat, soybeans, and hemp, since increases in yield were obtained without any delay in ripening. It is pointed out that the amount of work thus far completed limits the crops referred to.

Phosphorus investigations, J. L. ANTHONY (*Miss. Farm Res. [Mississippi Sta.], 7 (1944), No. 12, pp. 1, 7, 6*).—The crop response to sources of phosphorus and lime materials is summarized for soils of the hill section of the State. Differences in response are reported for various crops under the different soil conditions.

Phosphates and superphosphate, A. N. GRAY (*London: E. T. Heron & Co., 1944, 2. ed., pp. 416, illus. 38*).—This edition presents a statistical history of the phosphate and superphosphate industries and brings the statistical data up to 1939. The following topics are covered: Phosphates and their uses; production, grades, deposits and reserves, and consumption and trade; superphosphate—origin and history, production, cost of production, consumption, and trade; double superphosphate, calcined phosphates, and phosphate of ammonia; basic slag—production and consumption; and phosphoric acid.

Double superphosphate, A. L. MEHRING (*U. S. Dept. Agr. Cir. 718 (1944), pp. 24, illus. 4*).—The history of the development of the manufacture and of the use of double superphosphate is presented in this circular. In the definition of double superphosphate the author points out that the term "superphosphate" is a general term applied to fertilizer products obtained by treating phosphate rock, apatite, bone, or other phosphatic materials with either sulfuric or phosphoric acid, or with a mixture of both. In order to distinguish superphosphate made by acidulation of phosphates with phosphoric acid from other types of superphosphate, the specific name "double superphosphate" has long been used. In more recent years this material has also been called triple, treble, multiple, and concentrated superphosphate, Electrophos, and other names.

Double superphosphate, as manufactured in 1942, contained 46.5 percent available P_2O_5. Double superphosphate is considered as having the following advantages over other phosphoric materials: (1) For making certain high-analysis mixed fertilizers; (2) for direct use in agriculture in the United States at points distant from a superphosphate plant; (3) in the utilization of certain grades of phosphate rock unsuitable for manufacture of ordinary superphosphate; and (4) in the export market. It is also the ideal material for raising the grade of run-of-pile ordinary superphosphate.

Detailed information is presented on preparation processes, patents, history of production abroad, history of American production, production import and export statistics, uses, consumption, agricultural value, chemical composition, and physical properties.

Changes in pH and in base-exchange properties of cranberry soils following the use of alkaline water, H. H. HULL and N. E. STEVENS. (Univ. Wis. et al.). (*Soil Sci., 58 (1944), No. 5, pp. 405-408*).—Repeated flooding of cranberry soils with alkaline water will increase the base saturation to such an extent that an undesirably high pH value may result. Although under greenhouse conditions this can be brought about in a few years, it will probably take much longer in field practice. Since cranberry marshes are maintained for a long time, however, it appears probable that the regular use of alkaline water for flooding would eventually render them unprofitable for cranberry culture.

The influence of high concentrations of sodium sulfate, sodium chloride, calcium chloride, and magnesium chloride on the growth of guayule in sand culture, C. H. WADLEIGH and H. G. GAUCH. (U. S. D. A.). (*Soil Sci., 58 (1944), No. 5, pp. 399-403, illus. 2*).—Guayule plants were grown in sand culture with a control nutrient solution, and in cultures with this same solution but with 1, 2, and 3 atmospheres osmotic pressure of an added salt (sodium sulfate and sodium, calcium, and magnesium chlorides).

This species was found very sensitive to magnesium, the plants being killed by the lowest concentration of $MgCl_2$ used, but very tolerant of $CaCl_2$, making fairly satisfactory growth in the presence of 3 atm. osmotic pressure of added $CaCl_2$. The plants were relatively sensitive to sodium salts, and at the higher concentrations they were more sensitive to Na_2SO_4 than to NaCl at isosmotic pressures. In the light of these observations, guayule may not be regarded as a salt-tolerant plant.

Inspection of commercial fertilizers, F. W. QUACKENBUSH ET AL. (*Indiana Sta. Cir. 299 (1944), pp. 77, illus. 2*).—This circular presents the usual statistics on fertilizer sales and inspection, including analyses.

Fertilizer inspection, analysis, and use, 1943, M. F. MILLER, L. D. HAIGH, E. W. COWAN, J. H. LONG, and W. A. ALBRECHT (*Missouri Sta. Bul. 480 (1944), pp. 43*).—In addition to the usual analyses and statistics, this bulletin contains timely articles on Wartime Fertilizer Mixtures Approved for Missouri, 1944-45, by L. D. Haigh (pp. 3-4), and Present Observations and the Enlarging Outlook for Fertilizer, by L. D. Haigh and W. A. Albrecht (pp. 5-6).

AGRICULTURAL BOTANY

History and nomenclature of the higher units of classification, L. CROIZAT (*Bul. Torrey Bot. Club, 72 (1945), No. 1, pp. 52-75*).—The author has collected certain notes of interest to the history of botanical thought in general and believed to be even more valuable in elucidating much that is obscure about the origin and nature of systematic units above the genus level. "To be informed about history may rate as an amenity, but to handle these units with purposeful understanding is a necessity." The study consists of two parts: A historical review of the fundamental literature during 1735–89—in which artificial and natural classifications were at last clearly understood and ultimately separated—and additional data for 1789–1905; and a consideration of the issues of practical nomenclature in the units above the genus.

Fisiologia vegetale e piante agrarie [Plant physiology and agricultural crops], R. CIFERRI (*Firenze (Florence): G. Barbèra, 1943, pp. 835+, illus. 300*).—A comprehensive textbook of plant physiology, with bibliography of 13 pages and author and subject indexes.

The outline classification used in the Bergey Manual of Determinative Bacteriology, R. S. BREED, E. G. D. MURRAY, and A. P. HITCHENS. (N. Y. State Expt. Sta. et al.). (*Bact. Rev., 8 (1944), No. 4, pp. 255–260*).—The outline presented has been developed from previous classifications by the editorial board of the manual for use in the sixth edition (in press) of the Bergey Manual. The historical background (24 references) of the work is included.

Routine tests for the descriptive chart: Morphological and biochemical (*Pure Cult. Study Bact., 12 (1944), No. 4, Leaflet 5, 9. ed., pp. 23+, illus. 1*).

Recent advances in our knowledge of the physiology of microörganisms, C. B. VAN NIEL (*Bact. Rev., 8 (1944), No. 4, pp. 225–234*).—A review, with 25 references.

A growth-delaying effect of ultraviolet radiation on bacterial viruses, S. E. LURIA (*Natl. Acad. Sci. Proc., 30 (1944), No. 12, pp. 393–397*).—Ultraviolet radiation, besides inactivating bacterial viruses (bacteriophages), produces a delay in the growth of the surviving virus particles on a sensitive host, this delay becoming longer with increasing doses of radiation. This effect is nonhereditary and more or less strongly marked with different viruses. It is apparently due to the cumulative effect of the quanta absorbed by the virus particles before their inactivation. No similar effect was found on virus particles surviving X-ray irradiation. This is explained by the fact that for ionizing radiation nearly each act of absorption by a virus particle is effective in producing inactivation; the surviving particles are likely not to have absorbed any radiation at all.

Progress in methods of slime control, J. R. SANBORN. (N. Y. State Expt. Sta.). (*Paper Trade Jour., 119 (1944), No. 25, pp. 37–42*).—Investigation of the slime flora prevalent in 340 pulp, paper, and paperboard mills indicated that coliform bacteria were present in 52.6 percent, mold-type fungi in 47.6, and yeastlike organisms in 41.8 percent; and that among the organisms isolated as the principal types, slime-forming fungi and *Aerobacter* spp. were somewhat more prevalent than other groups of micro-organisms. It is concluded that satisfactory control can be obtained only where lethal agents come in direct contact with the living cells; in order to give germicidal agents a chance to work, removal of slime masses is thus necessary. The killing effects of treatments can be considerably increased through use of selected groups of chlorinated phenols employed in suitable combinations of mixtures to produce additive germicidal action. Through use of such procedures, a type of microbiological control can be secured which is not greatly affected by changing conditions, such as seasonal variations.

Studies with Bacillus polymyxa.—III, Nutritional requirements, H. KATZNELSON and A. G. LOCHHEAD (*Canad. Jour. Res., 22 (1944), No. 6, Sect. C, pp. 273–279*).—In further studies (E. S. R., 92, p. 328), 82 strains grew in a medium consisting of inorganic salts, glucose, and casein hydrolysate only when biotin was added. Thiamine stimulated growth of some strains but inhibited others; pantothenic acid, niacin, riboflavin, pyridoxine, and inositol were without effect. Casein hydrolysate was replaceable by urea, $(NH_4)_2SO_4$, and a mixture of 18 amino hydrolyzed acids, but with few exceptions these substances were not as effective as the protein. Asparagine and KNO_3 were poor sources of N. Yeast extract, in a medium containing only glucose and inorganic salts, proved superior in stimulatory effect to all other substances tested.

The seasonal production of agar in Gelidium cartilagineum, a perennial red alga, N. C. Cooper and G. R. Johnstone (*Amer. Jour. Bot., 31 (1944), No. 10, pp. 638–640, illus. 1*).—Two series of 50-gm. samples of the alga—collected at the low tide belt near San Pedro, Calif.—were oven-dried and used in extracting agar to obtain a comparative production for each month of the year. May and June in both series produced more agar than any of the other months; there was a diminution during December-March.

A modification of the method for estimating the anti-bacterial activity of fungi that are difficult to grow on liquid media, W. H. Wilkins and G. C. M. Harris (*Nature [London], 154 (1944), No. 3914, pp. 578–579, illus. 2*).—A modification of the method previously noted (E. S. R., 91, p. 651).

Investigation into the production of bacteriostatic substances by fungi.—Preliminary examination of a fourth 100 species, all Penicillia, W. H. Wilkins and G. C. M. Harris (*Brit. Jour. Expt. Pathol., 25 (1944), No. 5, pp. 135–137*).

Concentration and preservation of crude penicillin, T. T'ung (*Soc. Expt. Biol. and Med. Proc., 54 (1943), No. 1, pp. 103–105, illus. 2*).—The volume of penicillin was greatly reduced, with considerable increase in potency of the active principle, by low vacuum concentration. After an initial drop the titer of concentrated material kept in a dry-ice cabinet was maintained for as long as 6 mo.

A cylinder guide for use in plate assay of penicillin, E. J. Oswald and W. A. Randall (*Science, 101 (1945), No. 2613, pp. 99–100, illus. 1*).—A guide or template is described which facilitates placing the cylinders on the agar surface in the plate assay of penicillin. The general plan of conducting the assay is discussed, and several advantages of the procedure are noted.

Additions to the mycological flora of the Chicago region, J. M. Roberts. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 29 (1943), pp. 51–53*).—In the summer of 1940 the author collected 115 species of agarics in the Chicago area, 43 of which are reported as new to the region and listed. The total of agarics for this area at present is said to be 48 genera, 339 species, and 18 varieties.

More fungi from Florida, W. A. Murrill. (Fla. Expt. Sta.). (*Lloydia, 7 (1944), No. 4, pp. 303–327*).—New species are described under the genera *Clitocybe, Gymnopus, Hydrocybe, Lactaria, Lepiota, Melanoleuca, Monadelphus, Omphalina, Prunulus, Russula, Venenarius, Lepista, Cortinaria, Hebeloma, Naucoria, Agaricus, Coprinus, Stropharia, Ceriomyces, Gyroporus,* and *Ganoderma.*

Rhizophagus in citrus, J. C. Neill (*New Zeal. Jour. Sci. and Technol., 25 (1944), No. 5, Sect. A, pp. 191–201, illus. 7*).—In New Zealand, *Rhizophagus* has been found in the roots of all plant species examined, with the possible exception of exotic pines associated with ectotrophic mycorhizas. *Citrus* spp. have proved susceptible to strains of *Rhizophagus* present in Auckland soils; experimental evidence indicates that it is probably neither harmful nor beneficial to these hosts. The biology of the fungus is briefly discussed.

The genera of Uredinales with citations, G. R. Bisby (*Imp. Mycol. Inst., Mimeog. Pub. 2 (1944), pp. 22+*).—An annotated list of genera of the rust fungi.

Studies upon Galera crispa, E. A. Bessey. (Mich. State Col.). (*Mich. Acad. Sci., Arts, and Letters, Papers, 29 (1943), pp. 9–14, illus. 1*).—Drawing conclusions from the data presented, the author believes that the small mushroom *G. crispa* represents a mutation from *G. lactea.*

Indiana plant distribution records, IV—1943, C. C. Deam et al. (*Ind. Acad. Sci. Proc., 53 (1943), pp. 105–115*).—A continuation (E. S. R., 90, p. 738).

Seasonal growth of twigs of trees in the batture lands of the New Orleans area, J. Bonck and W. T. Penfound (*Ecology, 25 (1944), No. 4, pp. 473–475*).—The data presented are for *Salix nigra*, *S. interior*, *Hicoria pecan*, and *Celtis mississippiensis* during the growing season of 1943.

A revision of Lacmellea and the transfer of Zschokkea (Apocynaceae), J. Monachino (*Lloydia, 7 (1944), No. 4, pp. 275–302*).—A taxonomic study—involving new nomenclature and with a key to the species and varieties—of this latex-producing group of plants, members of which furnish material for crewing gum and rubber.

A contribution to the character of the heterogeneous form of Robinia pseudacacia L. var. monophylla Kirchn., D. N. Beketovskii (Beketovsky) (*Bot. Zhur. S. S. S. R. (Jour. Bot. U. R. S. S.), 29 (1944), No. 1, pp. 29–35; Eng. abs., p. 35*).—This variety of the black locust tree with simple leaves was found to produce only small or medium-sized fruits, which contain a smaller number of seeds. Some of the seeds fail to ripen at all.

Early studies of milkweed utilization in Canada, H. A. Senn (*Canad. Field Nat., 58 (1944), No. 5, pp. 177–180*).—A review of early published reports (five references).

Soil reaction in relation to the distribution of native species, M. H. Stone (*Ecology, 25 (1944), No. 4, pp. 379–386*).—The relation of soil reaction to plant distribution in 25 acres of forest soil in Ohio was analyzed by the chi square technic, using the hypothesis that the plant species occur with the same percentage frequency at every pH value within the soil reaction range of the area; i. e., the species are independent of the pH value of the soil within the pH range investigated. The results obtained indicated that no relationship could be shown between the soil reaction and the distribution of *Acer rubrum*, *A. saccharum*, *Betula lenta*, *Fagus grandifolia*, *Arisaema triphyllum*, *Erythronium americanum*, *Gaultheria procumbens*, *Maianthemum canadense*, *Podophyllum peltatum*, and *Viola hastata*. On the other hand, *Tsuga canadensis* was not independent of the pH value of the soil within the range studied. The distribution of *Claytonia virginica* conformed with the stated assumption when the pH classes were within the observed range of occurrence of the plant. Furthermore, no relationship could be demonstrated between the soil acidity and the distribution of any of the herbaceous species studied if the limits of the pH classes were reduced to coincide with the pH range in which the plant grew most abundantly in the given area. There are 27 references.

Effect of cotton on the germination of Phycomyces spores, W. J. Robbins and M. B. Schmitt (*Bul. Torrey Bot. Club, 72 (1945), No. 1, pp. 76–85, illus. 2*).—A method of studying the germination of spores of *P. blakesleeanus* using 1 cc. of agar medium in spot plates of Pyrex glass is described. Extracts favoring germination were obtained by autoclaving cotton-plugged tubes. The active material was distilled from the cotton plugs by dry steam; it was thermostable, could be concentrated in water solution by evaporation, and disappeared on drying an active solution at 50° or 100° C. unless the solution was neutralized, but was not removed by heating moist or dry cotton at 100°. The material is believed to be an organic acid adsorbed by the cotton and freed by dry steam.

Further observations on the telemorphic effects of certain growth-regulating substances, J. M. Beal (*Bot. Gaz., 106 (1944), No. 2, pp. 165–178, illus. 12*).—In this further study (E. S. R., 91, p. 655), five substituted phenoxy compounds were applied to sweet pea, African marigold, and Red Kidney bean in both Carbowax 1500 and lanolin carriers; indole-3-acetic, α-naphthaleneacetic, and β-naphthoxyacetic acids, tryptophan, and naphthyl acetamide were also applied to the bean in both carriers. The findings indicated that the effectiveness of the carrier depends on the growth substance employed. In these experiments, larger growth responses and form changes resulted, on the whole, when Carbowax was the carrier, though with some substances the responses were essentially equal with both carriers and with 4-chlorophenoxyacetic acid the responses were much greater when lanolin was the carrier.

A comparison of the effect on plant growth of micro-elements and of indole acetic acid and colchicine, T.-L. Loo (*Ann. Bot. [London], n. ser., 8 (1944), No. 32, pp. 356–362*).—The author briefly summarizes the results of a series of experiments on the physiological role of Mn and other trace elements in the growth and development of plants; in these investigations the effects of indole-3-acetic acid and colchicine were usually studied at the same time as those of the trace element.

A simple apparatus for sand culture work, M. E. PADDICK (*Plant Physiol., 19 (1944), No. 4, pp. 704–705, illus. 3*).—The inexpensive device described is particularly suited to set-ups involving substrate materials (such as sand-clay mixtures) through which water movement is slow and in which internal washing effects are difficult to prevent; it is also of value where the use of metal is to be avoided or where the irrigation system should be well enclosed. A glazed culture jar with vertical walls and a drain hole on the side is used as container for the sand; a large Erlenmeyer-type Pyrex glass flask serves as the solution reservoir. Details of construction are illustrated and described.

Effects of isosmotic concentrations of inorganic and organic substrates on entry of water into corn roots, H. E. HAYWARD and W. B. SPURR. (U. S. D. A.). (*Bot. Gaz., 106 (1944), No. 2, pp. 131–139, illus. 3*).—The evidence presented is believed to indicate that the osmotic pressure of the substrate is one of the primary factors in controlling the rate of water entry into the roots. It is also recognized that the character of the solute and the toxicity of salts or ions may have a significant bearing on this function. The conflicting data on the effect of organic substrates are discussed in the light of other work (23 references). The results with inorganic substrates showed that under the conditions employed no significant differences in rate of intake occur when isosmotic pressures of Na_2SO_4, NaCl, or $CaCl_2$ are used as single salts.

Age variations in the absorbing activity of root systems, O. S. SEMENOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 8, pp. 354–356, illus. 1*).—On the basis of experiments with *Vicia faba* plants grown in Knop's solution, it is concluded that the mineral absorption rate by the roots decreases with age of plant and that it is largely an active process.

Influence of plant extracts, proteins, and amino acids on the accumulation of selenium in plants, S. F. TRELEASE and S. S. GREENFIELD (*Amer. Jour. Bot., 31 (1944), No. 10, pp. 630–638, illus. 9*).—When young plants of corn and *Astragalus racemosus* were grown in culture solutions containing sodium selenite and organic Se from an aqueuos extract of *A. bisulcatus* at equivalent Se concentrations, both species accumulated far greater amounts of Se from the latter culture solutions. *A. racemosus* exhibited a much greater capacity than corn to accumulate Se from either culture solution; it was also more susceptible to toxic components of the plant extract but less affected by high concentrations of Na_2SeO_3. Though not identified, the Se in the aqueous extract was shown to be present in molecules sufficiently small to diffuse readily through a cellophane membrane; the dialyzed Se had the same toxicity as that in the original extract and was accumulated in the same amount by young corn plants. Extract of nonseleniferous alfalfa hay—added to culture solutions containing Na_2SeO_3—caused an increase in the accumulation of Se by corn plants; specific proteins, protein derivatives, and amino acids—when added to the culture solution for corn—also increased the absorption and storage of Se from Na_2SeO_3. This effect on Se accumulation is said to be one of the few recorded cases in which an organic compound has been shown to increase the absorption of an inorganic element by plants. Though the cultures were not maintained free from micro-organisms, there were no indications that these had any significant influence on the findings reported.

Physiological studies in plant nutrition.—XI, pt. 2; XIV (*Ann. Bot.* [*London*], *n. ser., 8 (1944), No. 32, pp. 323–356, illus. 8; pp. 363–385, illus. 7*).—Two contributions are included:

XI. *The effect on growth of rubidium with low potassium supply, and modification of this effect by other nutrients—pt. 2, The effect on dry-weight distribution, net assimilation rate, tillering, fertility, etc.*, F. J. Richards.—In continuation of earlier studies on barley (E. S. R., 86, p. 305), differences in net assimilation rate were found to account for most of the observed differences in growth under the various treatments used (supplementary nutrients being two P levels in high NH_4-low Ca and in high Ca-NH_4 solutions; a solution of intermediate composition was also used at the high P level). It is suggested that in this experiment the internal P level is one of the dominant factors determining assimilation rate; reduced rates are to be expected when P is either deficient or in excess. The level of P was also a dominant factor in determining the rate of tillering, and early effects of Rb on tillering appear to originate in previous restrictive effects on P uptake; except where P is in excess, Rb reduces early tillering. The final effect of Rb is to increase the number of tillers; this is interpreted as a toxicity effect, resembling Na in this respect. Reduction in the root : top ratio is highly influenced by P; various correlations support the hypothesis that competition occurs between the roots and young tillers for available assimilate, and hence that root size in any treatment depends on the amount of tillering induced by that treatment.

Water contents were increased by raising the P supply and reduced by applying Rb; K supply exerted no consistent effect. The effects of treatments were largest in those groups with highest water contents—interpreted as an effect of carbohydrate level. The ratio of dead to living tops was decreased by raising the K level and much decreased by an equivalent application of Rb—one of the outstanding effects of Rb in this study. The toxicity of excess P and its reduction after adding Rb was sufficient to account for the whole result. Toxicity presumably leads first to a reduction in assimilation rate, then to increased succulence, and finally to death of leaves and tillers. The ear and grain data showed large differences in the Rb effects at the two P levels. Effects of Rb are probably indirect and consequent on previous effects during vegetative phases. There were highly significant correlations of net assimilation rate during the vegetative period with many of the ear and grain data; these appeared to be largely independent of the nutrient conditions causing the observed differences in assimilation rate. Certain possible causes of sterility within the ear are discussed, and it is concluded that grain production and unusually late tillering are competitive processes—if not for carbohydrate, at least for K.

XIV. *Sugar metabolism in the barley stem in relation to ear development*, H. K. Archbold and C. Datta.—In further studies of the sugar metabolism of barley (E. S. R., 88, p. 744), no significant effects of shading the stems and of removing ears or leaves on the fraction of the dry-weight soluble in cold water—other than sugar—were observed. Stems were shaded at 50, 66, and 80 days and leaves or ears removed at 66 days from sowing. Stem shading affected all plant organs; when sugar was still increasing, it restricted both residual dry weight and increase in sugar, but treatment at the time of the sugar maximum failed to induce polysaccharide break-down or to accelerate the rate of sugar loss. In stems and ears, reduction of sugar level was induced by a temporary check in sugar accumulation, from which there was complete recovery within a week, storage being resumed at a normal rate. Relative rates of sugar loss were either reduced slightly or not affected; absolute rates of loss depended primarily on the maximum reached and were low where these maxima were diminished by early treatment.

Defoliation prevented sugar accumulation and restricted residual dry-weight increase, whereas ear removal led to a general increase in sugar level but also tended to inhibit residual dry-weight increase in the stem. Tillers lacking leaves and ears behaved like defoliated tillers, except for maintenance of a slightly higher sugar level. Stem sugars in all treatments reached maxima at the same time and then fell to zero by about 115 days after sowing. The high values reached in earless tillers thus led to rates of sugar loss even greater than in normal tillers, whereas in defoliated tillers, where the maxima were much depressed, rates of loss were low in spite of the depleted carbohydrate supply.

The results of both experiments support the views expressed in earlier papers (1) that free sugars in barley stems are not precursors of starch in the ear, and that their loss from the stem is an inevitable senescent change and not a controlled movement in response to growth demands of the ear; and (2) that major breakdown of polysaccharide does not occur, so that the ear depends on primary assimilate immediately translocated to it or produced in situ. Since shaded or earless stems failed to make normal growth in the presence of increasing amounts of sugar, it appears that utilization of sugar depends mainly on factors other than the carbohydrate supply. The question of the amount of material supplied to the ear by assimilation in the stems is discussed; at present the available results are said to be conflicting.

Plant growth under controlled conditions.—III, Correlation between various physiological processes and growth in the tomato plant, F. W. WENT (*Amer. Jour. Bot., 31 (1944), No. 10, pp. 597–618, illus. 17*).—In the same San Jose Canner tomatoes used to demonstrate the existence of thermoperiodicity (E. S. R., 91, p. 136), a number of physiological processes were studied under the optimum v. suboptimum conditions described. Though the elongation rate of stems decreased sharply during the day, the suction force of the leaves remained essentially constant under constant temperature; only just prior to wilting did a sharp rise occur. The osmotic concentration or pressure of the expressed cell sap was less than half that of the intact cell as measured by plasmolysis or by the suction force at the wilting point. Stomata opened soon after sunrise, remained open during the morning (except with insufficient watering), and closed early in the afternoon. In a dry atmosphere they did not open quite as far and closed somewhat earlier. Darkness, on the other hand, had a much greater effect; when the normal night was artificially lengthened, the stomata opened much less after transfer of plants into the light; temperature had practically no effect on stomatal opening. The changes in stomatal opening were not accompanied by changes in the suction force of the leaf cells. Transpiration changed rapidly with alterations in external conditions—especially light. Considerable fluctuations may occur without measurable changes in stomatal opening; the reverse is also true.

Use of radiophosphorus indicated that phosphate uptake is greater by day and at 26.5° than at 18° C. Bleeding under constant conditions showed a strong periodicity with a maximum around noon and a minimum during the night, its rate depending largely on the sucrose concentration in the root system. A strong negative correlation existed between bleeding and stem growth rate. In carbohydrate determinations, only sucrose values showed a clear correlation with external conditions, its concentration in the leaves rising rapidly during the morning, falling off slightly during the afternoon, and decreasing most at night. In the morning the concentration in leaves of plants kept at 26.5° during the night was significantly higher than in plants kept at 18°–20°. When leaves or stem tips were dried, the amount of auxin which could be extracted with ether increased; during the first hour a large amount was extractable, decreasing in later hours to a steady rate that was kept up for weeks. Auxin production in cut stems and leaves continued for many hours; it first decreased but later increased when cut tips were placed in the dark. The amount of extractable auxin exhibited two daily maxima (morning and afternoon) and two minima (noon and midnight). There was no correlation of day or night temperature or of growth rate with auxin content. Photosynthesis reached its optimum near 1,000 footcandles, was only slightly lower at 18° than at 26.5°, but was significantly lower at 8°. Sugar translocation was small at 26.5°, but steadily increased with lowering of temperature down to 8°. The elongation rate of isolated roots and of the stem by itself was much greater at 26.5° than at 18°.

On the basis of all the evidence gathered, it is concluded that—except just before wilting—the water supply does not limit growth. The hormones considered (auxin, thiamine, caulocaline) are present in sufficient amounts and do not control growth. The light process with an optimum temperature of 26° or higher which controls growth during the day probably is photosynthesis (or perhaps salt intake). The optimum temperature of 18° during the night is caused by a dual control—above 18° the rate of sugar translocation limits growth of stems as well as of roots and fruits; below 18° the rate of the growth process itself becomes limiting. There are 47 references.

Plant fats in relation to environment and evolution, J. B. McNair (*Bot. Rev., 11 (1945), No. 1, pp. 1-59*).—In a search for proper identification of plant groups and their true sequence in evolution, the chemical and physical properties of their fats may be of value. This paper presents a comprehensive review of the literature (120 references) pertaining to this thesis.

The effect of disc thickness on the respiration and the various nitrogen fractions of cut discs of radish roots immersed in water and in sugar solutions, H. Saïd and E. D. H. el Shishiny (*Plant Physiol., 19 (1944), No. 4, pp. 660-670, illus. 4*).—The study involved tissue slices of varied thickness washed in water and then floated on distilled water or sucrose solutions. Respiration and nitrate reduction in the radish slices was increased as their thickness was diminished. Sucrose uptake and protein synthesis were both increased as the thicknesses decreased from 4 to 1 mm.; slices less than 1 mm. in thickness showed no further increase in sugar uptake or protein synthesis. The N fractions playing a major role in protein synthesis in these radish disks of varying thickness were the nitrate and the "other nitrogen." The amide and ammonia N were not significantly affected by variations in disk thickness.

A method for measuring root respiration, D. G. White and N. F. Childers. (Ohio Expt. Sta.). (*Plant Physiol., 19 (1944), No. 4, pp. 699–703, illus. 3*).—By the method described and illustrated in detail, the roots are grown in a medium permitting root and top development similar to that in the field, and the air about the roots can be placed in a closed system so that it is reutilized by the roots for several days while air samples are being withdrawn. Hence the respiratory response of the roots can be determined under conditions similar to those of poor soil aeration in the field, the data can be corrected for respiration of micro-organisms or this can be prevented, the equipment is standard and widely available, and only a few minutes are required to make the daily air analyses.

Spectroscopic stability of chlorophylls a and b and certain analytical considerations, F. P. Zscheile, C. L. Comar, and D. G. Harris. (Purdue Univ.). (*Plant Physiol., 19 (1944), No. 4, pp. 627–637*).—The effects of long-time storage at low temperatures on the absorption curves of chlorophylls *a* and *b* were studied.

Purified preparations of chlorophyll *a* in ether solution were stable for a week or more, after which deterioration was evident; the behavior of dried samples was less predictable. Chlorophyll in crude extracts in ether appeared more stable than in purified preparations. Satisfactory analytical results were obtained on ether extracts from tomato leaves after 14 weeks at —20° C.; storage of fresh corn leaves at 20° for 1 mo. failed to influence analytical results, but chlorophyll deteriorated during longer periods. Storage of leaves in acetone showed some advantages for very long storage periods (7 mo. or more). Small amounts of ethanol, methanol, or acetone in ether solutions and 20 percent water in acetone solutions caused absorption changes; hexane induced no changes in ether solutions. Spectroscopic effects of solvent impurities and of acids are discussed in relation to chorophyll analysis, standards for spectroscopic analysis are considered in relation to stability factors, and comparisons are made from the standpoint of practical application to plant materials. There are 19 references.

Culture conditions and the development of the photosynthetic mechanism.—II, An apparatus for the continuous culture of Chlorella, J. MYERS and L. B. CLARK (*Jour. Gen. Physiol., 28 (1944), No. 2, pp. 103–112, illus. 1*).—The apparatus developed and here described is said to maintain a constant density population of *Chlorella* by automatic dilution of the growing culture with fresh medium. Cells harvested therefrom in daily samples were highly uniform in rates of growth and of photosynthesis measured under arbitrarily chosen conditions.

The growth of Chlorella pyrenoidosa under various culture conditions, J. MYERS (*Plant Physiol., 19 (1944), No. 4, pp. 579–589, illus. 5*).—In this first of a series of papers on culture conditions and the development of the photosynthetic mechanism, the growth of *C. pyrenoidosa* was studied under various culture conditions by means of hemocytometer counts. During the growth of a culture the nitrate and H-ion concentrations were considerably diminished. It was shown on theoretical grounds and experimentally confirmed that the rate of provision of CO_2 may limit growth in such a way as to give rise to a linear growth rate. Higher populations and longer periods of logarithmic growth may be attained by exposing thinner layers of the algal suspension to the incident illumination. The changes in growth conditions within any one culture are manifold, and hence it will be difficult to relate any one of these conditions to effects on the photosynthetic mechanism. There are 17 references.

Light and pigment development in the kidney bean, R. A. WHITMORE (*Plant Physiol., 19 (1944), No. 4, pp. 569–578, illus. 1*).—When red kidney bean seedlings were grown in gravel and tap water under three wavelengths and intensities of light and in darkness, a maximum loss of weight was noted in plants under red light and a minimum under blue light; the weight loss under green light was about equal to that in darkness. Calculation of dry-weight ratios indicated that maximum translocation of reserve material had occurred in plants under red light and that the proportion translocated to the roots was larger than in those under green or blue light; the least translocation was in plants grown in darkness, and the proportion remaining in the region of the hypocotyl and cotyledons was a maximum in these plants. On a fresh-weight basis of the leaves, the maximum amount of chlorophyll and carotene was developed under the green light and the maximum carotenol was developed in darkness and was about equal to that formed under red light. The minimum chlorophyll content was in plants grown under blue light, the minimum carotene under the red, and the minimum carotenol under the blue light. When the total pigment developed by 80 plants in each plot was calculated, the maximum chlorophyll and carotenol was found in plants grown under red light—excluding the dark plot from chlorophyll comparison—and the maximum carotene under green light. The minimum chlorophyll and carotenol was in plants under blue light and the minimum carotene in those in the dark.

Simulation of photoperiodicity by thermoperiodicity, F. W. WENT (*Science, 101 (1945), No. 2613, pp. 97–98*).—It appears from the experimental data presented that the development of tomato plants is not limited by photosynthesis, but that the use of the photosynthates is regulated by processes occurring in darkness at temperatures between 15° and 20° C. This is not true for all plants, since covering beet plants produced only slight and insignificant increase in weight. These studies show that under certain conditions—by proper treatment—the apparent efficiency of photosynthesis can be considerably increased in tomatoes. The effects of covering in these tests were due to thermoperiodicity rather than to photoperiodicity.

Tree foliation affected by street lights, C. A. SCHROEDER. (Univ. Calif.). (*Arborist's News, 10 (1945), No. 1, pp. 1–3, illus. 2*).—"A striking example of prolonged leaf retention in the autumn and subsequent delayed foliation in the spring as the result of supplemental lighting has been observed for several years past in groups of ornamental trees in the cities of Los Angeles and Beverly Hills, Calif."

Effects of controlled shading upon the development of leaf structure in two deciduous tree species, I. T. ISANOGLE (*Ecology, 25 (1944), No. 4, pp. 404–413, illus. 6*).—After exposure of buds in cheesecloth-covered compartments transmitting 70, 48, 22, and 10 percent of full sunlight, respectively, leaf samples of *Cornus florida rubra* and *Acer platanoides* were taken at intervals and studied to compare the effects of differences in light intensity on cell division and elongation in comparison with leaves from the opposite buds exposed to full sunlight. Cell divisions took place in both planes in the development of mature from embryonic leaves in both species, even with the light intensity reduced by 90 percent; all comparable shaded and unshaded mature leaves had the same number of cell layers. Cell divisions increasing the number of cell layers in *Cornus*—from that of the embryonic to that of the mature leaves—occurred before the leaves were 2 cm. long. Since the number of cell layers in shaded and unshaded leaves of each species was the same, differences in light intensity did not affect this process. However, anticlinal cell divisions in the plate meristems responsible for leaf blade expansion in the area were fewer under reduced than under full sunlight. Mature shaded leaves were smaller in area and thinner in cross section than those from opposite unshaded shoots, this difference being due largely to less elongation of the cells in the shaded leaves. All the anatomical differences noted in cross section and most of them in leaf area resulted from variations in cell elongation. Differences in light intensity did not equally affect cell elongation in both planes during development. Light intensity had the greatest influence on elongation of cells in both planes after the leaves were 3 cm. long. There are 36 references.

On the relation between leaf development and formation of lacticiferous vessels in roots of kok-saghyz and krym-saghyz, A. A. NICHIPOROVICH and E. F. IVANITZKAJA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 44 (1944), No. 1, pp. 33–36*).—The lactiferous vessels of kok-saghyz and krym-saghyz are arranged as concentric circles in the bark. It was found that the rhythm of formation of these vessels depends in only a secondary manner on the intensity of leaf formation; the more numerous the leaves produced within the period of intense formation, the better do they influence subsequent thickening of the roots and the consequent development of a larger number of lactiferous vessels therein. The correlations brought out in this study show that a plant should be stimulated to produce at the earliest stage a maximum number of leaves and later on an intense thickening of the root with its lactiferous vessels, and thus to increase the rubber content of the plant.

On the possibility of rubber formation by plants on heterotrophic nutrition

with carbohydrates, A. A. Prokofiev (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 43 (1944), No. 4, pp. 170–173*).—Through experiments with both potted tau-saghyz plants and isolated roots it was found that the formation and accumulation of rubber actually proceeds in the lactiferous vessels of the roots under conditions of heterotrophic nutrition, and that it has no direct relation to photosynthesis and may even proceed without any above-ground parts of the plants available, provided there is a supply of carbohydrates. The hypothesis suggested by others that rubber synthesis takes place in the assimilatory tissues of such plants is considered to be in conflict with the evidence here presented.

Some anatomical effects of moisture stress in nursery seedlings of guayule, F. T. Addicott and J. B. Pankhurst (*Bot. Gaz., 106 (1944), No. 2, pp. 208–214, illus. 6*).—When, under the experimental conditions, sections of root-crown, young stem, and leaf of nursery plants that had been subjected to three levels of moisture stress were examined anatomically, it was found that this factor had no effect on the thickness of the cork, width of the vascular rays or length of cells in the cortex or epidermis, width of cells in the cork or rays, or on the number of cells along a diameter of the pith. Low moisture stress, on the other hand, led to increased cambium activity, resulting in greater xylem and phloem areas with correspondingly longer vascular rays. The diameter of the pith and the size of its cells were also greater under the low moisture stress. At the intermediate moisture stress, xylem development appeared to have priority over that of phloem. High moisture stress led to increased deposition of rubber and lignin and to considerable enlargement of the resin canals. In general, low moisture stress led to enlargement of the tissues of the plant with corresponding increases in rubber-bearing capacity. High moisture stress led to accumlation of the products of photosynthesis.

Toxic substances from the culture media of guayule which may inhibit growth, J. Bonner and A. W. Galston (*Bot. Gaz., 106 (1944), No. 2, pp. 185–198, illus. 1*).—The experiments reported upon show that substances unfavorable to the growth of guayule plants emanate from their actively growing roots; these toxic materials are organic and can be extracted from nutrient solutions which have been previously flushed through gravel cultures of guayule plants. The growth-inhibitory substances contained in nutrient solutions which had been recirculated through guayule cultures proved to be ether-soluble acid compounds; they were not, however, isolated in pure form. A potent source of growth-inhibitory substances was found in water in which guayule roots had been allowed to soak for short periods of time. From such water two inhibitory compounds were isolated in crystalline form, viz, cinnamic acid and an unidentified organic acid.

Growth and heterocyst production in Anabaena cylindrica Lemm., G. E. Fogg (*New Phytol., 43 (1944), No. 2, pp. 164–175, illus. 2*).—During investigations on this nitrogen-fixing alga, observations on the growth of pure cultures shed some light on the nature of the Myxophycean heterocyst; the more important results are described and discussed.

Developmental morphology of vascular plants, H. B. Sifton (*New Phytol., 43 (1944), No. 2, pp. 87–129*).—A comprehensive review (9.5-page bibliography) of the modern science of plant morphology as developed during the past 100 yr. or more.

Algunos casos teratológicos en Gramíneas [Some cases of teratology in the grass family], R. Martínez Crovetto (*Rev. Argentina Agron., 11 (1944), No. 2, pp. 106–115, illus. 7*).

Observations on the presence of stomata in some species of Cuscuta, T. G. Yuncker (*Ind. Acad. Sci. Proc., 53 (1943), pp. 100–104, illus. 1*).—Thirteen species of this parasitic phanerogamic genus are discussed.

The development of the seed of Liriodendron tulipifera L., A. T. Guard. (Purdue Univ.). (*Ind. Acad. Sci. Proc., 53 (1943), pp. 75–77, illus. 4*).

GENETICS

Gene segregation in autotetraploids, T. M. LITTLE (U. S. D. A.). (*Bot. Rev., 11 (1945), No. 1, pp. 60–85*).—In summarizing this comprehensive review (84 references), the author states that three main theories of autotetraploid segregation have been propounded, viz, the Muller hypothesis based on the random assortment of chromosomes at meiosis, that of Haldane based on the random assortment of chromatids, and that of Mather in which the ratios are considered as not fixed but varying according to the amount of quadrivalent formation and the distance of a gene from the centromere. The last is believed most satisfactory in explaining observed data. Though many autotetraploids do not lend themselves readily to genetic analysis, due to sterility, chromosome differentiation, or lack of good genetic characters, fairly extensive studies have been carried out on the autotetraploid genetics of 10 species and genera. The cytological variables affecting autotetraploid segregation are mode of pairing, formation of quadrivalents, and number and position of chiasmata. In progenies unaffected by other variables it is possible to gain an estimate of the position of the gene involved with respect to the centromere. Differential viability markedly affects some of the autotetraploid ratios and can account for some of the discrepancies between observed data and expectancies. Incomplete dominance is more common among tetraploids than among diploids due to the greater number of genotypes possible for any given pair of factors. Because of striking differences between the genetics of diploids and tetraploids, plant breeding procedures applicable to diploids must frequently be modified in dealing therewith.

Mitosis: The movements of chromosomes in cell division, F. SCHRADER (*New York: Columbia Univ. Press, 1944, pp. 110+, illus. 15*).—The larger portion of this volume is taken up with the structure of the cell and its contents and with hypotheses of mitosis—used in the inclusive sense as covering any nuclear division involving a spindle apparatus and the division of chromosomes. Certain related problems are more briefly discussed, and an 18-page bibliography and a subject-author index complete the work.

High fertility of buckwheat tetraploids obtained by means of colchicine treatment, V. V. SACHAROV, S. L. FROLOVA, and V. V. MANSUROVA (*Nature [London], 154 (1944), No. 3915, p. 613*).—A brief note on what is stated to be the first case illustrating high fertility of an experimentally produced, agriculturally valuable autopolyploid form. Of practical importance is the fact that within 2.5 yr. highly fertile buckwheat forms with large seeds were produced, noncrossable with the initial diploid plants.

Inheritance of reaction to smut, stem rust, and crown rust in four oat crosses, G. W. COCHRAN, C. O. JOHNSTON, E. G. HEYNE, and E. D. HANSING. (Kans. Expt. Sta. coop. U. S. D. A.). (*Jour. Agr. Res. [U. S.], 70 (1945), No. 2, pp. 43–61, illus. 4*).—The inheritance of reactions to a mixture of races of *Ustilago avenae* and *U. levis,* races 2 and 8 of *Puccinia graminis avenae,* and race 1 of *P. coronata avenae* was studied in the field and greenhouse in the four crosses, Richland-Fulghum × Fulghum-Victoria and reciprocal, Fultex × Richland-Fulghum, and Anthony-Bond × Richland-Fulghum. In the first three crosses each parent carried a dominant factor for resistance to smut. When these two independently inherited duplicate dominant factors were both absent the plant was susceptible to smut. In the last cross the inheritance was similar except that there was one dominant factor for high resistance to smut and one for moderate resistance. Resistance to stem rust was dominant in all four crosses and appeared to be governed by a single factor. In the three crosses involving the Fulghum-Victoria and Fultex type of resistance to crown rust, resistance was dominant and due to a single factor difference. The crown rust reaction of Anthony-Bond × Richland-Fulghum was controlled by the interaction of four factor pairs—two sets of dominant complementary factors. One set, dominant complementary genes for resistance, was carried by Anthony-Bond (resistant parent), and the other set, dominant complementary inhibitor genes epistatic to the genes for resistance, was carried by Richland-Fulghum (susceptible parent). Observations in F_2 and F_3 proved to be statistically near the expected ratios. No association between the factors determining the reaction to different diseases was noted in any of the crosses studied.

Fertility and sterility relationships among hybrid and specific plum varieties involving eight different Prunus species, W. S. FLORY, JR. (Va. Expt. Sta.). *(Va. Acad. Sci. Proc., 1944, pp. 43–44).*—A summary of work conducted by the author while at the Texas Station presents information on self and cross fertility in a large number of species and varieties of plums. All species used except *P. caroliniana* (2N = 32) had 16 diploid chromosomes. The Methley plum, with a set of 3 percent of fruit upon selfing, was the only one of 15 varieties so tested to produce fruit.

The inheritance of chlorophyll deficiencies in cultivated lettuce, T. W. WHITAKER. (U. S. D. A.). *(Jour. Hered., 35 (1944), No. 10, pp. 317–320, illus. 2).*—Chlorophyll-deficient plants occur sporadically in lettuce fields. The author describes the phenotypic appearance and genetic behavior of four different types of chlorophyll deficiencies. Three cases proved to be cytoplasmic and transmitted by the maternal parent, and the fourth was apparently dependent upon the result of a mutation by a single recessive gene. It is conceded that it is unlikely that either class of chlorophyll deficiency will become a factor in lettuce production, since albino and chlorotic plants are easily eliminated from the seed fields.

Inheritance of bulb color in the onion, A. E. CLARKE, H. A. JONES, and T. M. LITTLE. (U. S. D. A.). *(Genetics, 29 (1944), No. 6, pp. 569–575).*—An analysis of the results of crosses made between a large number of commercial varieties and inbred lines indicated that three pairs of genes are involved in the development of pigments in the onion bulb, namely, a basic color factor, *C-c,* necessary for the production of any pigment; a factor, *R-r,* when the basic color factor, *C-c,* is also present; and an inhibiting factor, *I-i,* which when present in the form of *II* is responsible for the production of white bulbs. In one cross a correlation was noted between color and weight of bulbs, suggesting that the color inhibiting gene, *I,* is linked genetically with one or more growth factors or that this gene is directly responsible for smaller bulb size.

The origin of Lilium testaceum, S. L. EMSWELLER and M. B. STEWART. (U. S. D. A.). *(Jour. Hered., 35 (1944), No. 10, pp. 301–308, illus. 3).*—The chromosome morphology in 5 plants of *L. chalcedonicum,* 16 of *L. candidum,* and 6 of *L. testaceum* was determined from root-tip smears. A high frequency of heteromorphic chromosome pairs was found in *L. chalcedonicum* and some of them also in *L. candidum.* It was possible to assort the latter plants into four groups, each varying from the other three in the number of certain chromosomes present. One type, *L. candidum purpureo-striatum,* had originated following a translocation of the major portion on one arm of the *K* chromosome to the long arm of the *A* chromosome. The chromosomes of *L. testaceum* indicated that it had probably arisen from a cross between one of the types of *L. chalcedonicum* and one of those of *L. candidum* here described.

The inheritance of certain mutant characters in Venturia inaequalis, J. R. SHAY and G. W. KEITT. (Wis. Expt. Sta.). *(Jour. Agr. Res. [U. S.], 70 (1945), No. 2, pp. 31–41, illus. 3).*—Four mutant genes and the sex-reaction factors in *V. inaequalis* were located with reference to their centromeres. All characters studied were found independently inherited except *tan* and *white,* these two genes being located on the same chromosome arm—with *tan* 10.8 and *white* 6.0 cross-over units from the centromere. The effects of a single mutation on the behavior of the fungus may be varied and profound: The *white* mutant prevents development of the characteristic dark pigment in the thallus, induces abortion of ascospores, and probably by interaction with modifying factors suppresses the expression of pathogenicity in the line from which it arose. Another mutant, *small,* is shown to suppress macroscopic expression of pathogenicity, but penetration of the host is accomplished and a microscopic subcuticular development occurs. The importance of adequate attention to modifying factors in parental material before analyzing the inheritance of pathogenicity is emphasized.

Juniperus virginiana, J. horizontalis, and J. scopulorum.—III, Possible hybridization of J. horizontalis and J. scopulorum, N. C. Fassett. (Univ. Wis.). *(Bul. Torrey Bot. Club, 72 (1945), No. 1, pp. 42–46, illus. 4).*—It is shown from further studies (E. S. R., 92, p. 181) that where the two above species occur together there are several things which may happen: Near Sheridan, Wyo., the two occur on opposite sides of the road; *J. scopulorum* there shows tendencies toward *J. horizontalis* in several characters, but the latter exhibits no characters of the former. On the west slopes of the Big Horn Mountains, Wyo., and on the adjacent plains, where no *J. horizontalis* was found, and in the vicinity of Banff, Alberta, where the author has had no opportunity for field studies, there occurs a depressed shrub with the foliage and fruit of *J. scopulorum,* which is described as *J. scopulorum patens* n. var; it is suggested that this variety may have arisen by some ancient hybridization of *J. scopulorum* with *J. horizontalis.*

The improvement of industrial yeasts by selection and hybridization, C. C. Lindegren *(Wallerstein Labs. Commun., 7 (1944), No. 22, pp. 153–168, illus. 7).*—"The improvement of industrial yeasts by hybridization requires an understanding of the life cycle and a consideration of several purely scientific aspects of yeast biology. Among these are factors controlling sporulation, segregation, mutation, and selection. Yeasts exist in both haplophase and diplophase. Hybrids can be produced between haplophases of opposite mating types. Many haplophase cultures are sterile, but when fertile haplophase cultures of different origin are mixed a new hybrid is obtained. The haplophases can be cultured as such but are extremely variable due to mutations which occur during growth. The more stable illegitimate or legitimate diploids are generally used in industrial practice; but if the factors controlling competition between haplophase cells are considered, it is possible to use haplophase cultures for industrial purposes."

Incidence of metabolic changes among virus-resistant mutants of a bacterial strain, E. H. Anderson *(Natl. Acad. Sci Proc., 30 (1944), No. 12, pp. 397–403, illus. 1).*—Virus-resistant mutants were isolated from a virus-sensitive strain of *Escherichia coli* utilizing the selective action of three strains of bacterial viruses (bacteriophages) active on the parent organism. The mutants differed from the original strain in their resistance to either one, any two, or all three viruses, in all possible combinations. Morphological studies and qualitative physiological tests indicated all strains tested to have characteristics similar to the original organism. Of the 57 mutants isolated in pure culture, 28 were unable to grow in a basal medium but grew when 0.005 percent yeast extract was added to the medium. Three representatives were systematically tested with various combinations of 8 vitamins, 23 amino acids, and hydrolyzed casein, none of which—added to the basal medium singly or in combination—would support growth of these strains.

X-ray induced growth factor requirements in bacteria, C. H. Gray and E. L. Tatum *(Natl. Acad. Sci. Proc., 30 (1944), No. 12, pp. 404–410, illus. 5).*—Strains of two species of bacteria were obtained—following X-ray treatment—which were characterized by their inability to carry out specific biochemical reactions. Two strains of *Escherichia coli* differed from the parent strain, one by requiring biotin and the other by requiring threonine. Four mutant strains of *Acetobacter melanogenum* were obtained: The first required a supplement of serine or glycerine; the second, adenine or adenosine; and the third, leucine. With each strain there was little or no growth in the absence of the required substance as contrasted with the excellent growth of the parent strain in the appropriate minimum medium. The growth of each strain was a function of the concentration of the required substance. These results are taken to prove that the capacity of bacteria for carrying out specific biochemical reactions can be modified by X-ray treatment and suggest that biosyntheses in bacteria are controlled by specific genes.

Colonies of Penicillium notatum and other moulds as models for the study of population genetics, G. Pontecorvo and A. R. Gemmell (*Nature* [*London*], *154 (1944), No. 3913, pp. 532–534, illus. 8)*.

Effectiveness of selection on progeny performance as a supplement to earlier culling in livestock, G. E. Dickerson and L. N. Hazel. (U. S. D. A.). (*Jour. Agr. Res.* [*U. S.*], *69 (1944), No. 12, pp. 459–476, illus. 6)*.—Rate of improvement from selection in any closed population, ΔG, is the ratio of the average genetic superiority of parents (compared with the unselected group from which they were chosen), ΔP, to the average generation interval or age of parents when their offspring are born, T. Selection on progeny performance usually follows earlier culling and increases T as well as ΔP. Thus a regular plan of progeny testing is likely to increase the rate of improvement from selection only if (1) progeny performance is obtained early in the tested animal's lifetime, (2) the reproductive rate is low, and (3) earlier selections are relatively inaccurate, as for traits much affected by environment or observable only in relatives. The advisability of progeny testing was examined for representative traits of farm animals. Opportunity for improvement from selection is apparently maximum, or nearly so, for most of these traits when (1) selection on pedigree, individual performance, and family averages is fully utilized and (2) the interval between generations is kept short. The effect of progeny testing on expected progress ranges from a moderate increase for weanling traits of sheep to a definite decrease for growth rate of swine, with a small or doubtful increase for yearling traits of sheep, butterfat production of dairy cattle, and carcass traits of swine.

The hormones regulating reproduction, C. W. Turner. (Univ. Mo.). *(Guernsey Breeders' Jour., 67 (1945), No. 2, pp. 127–132, illus. 5)*.—A popular account of the origin and effects of the hormones concerned with heat, ovulation, and reproduction.

Striping patterns in domestic horses, J. A. Lusis (*Genetica* [*'s Gravenhage*], *23 (1942), No. 1, pp. 31–62, illus. 18)*.—Striping was distributed among very diverse breeds of domestic horses, and it is more distinctly expressed among primitive breeds than among standard breeds, due to continued selection against wild coat colors. In addition to atavistic striping, there occurs in very rare cases striping of a brindling pattern which, like brindling in cattle and dogs, must be regarded as a "new formation" of mutational origin. This study was based on variations in atavistic striping in different breeds of horses throughout the world.

Comparison of growth of Hereford and F_1 [Shorthorn × Hereford] heifers, A. L. Baker and J. R. Quesenberry. (U. S. D. A. coop. Mont. Expt. Sta.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 322–325)*.—In the heifer phase of a crossbreeding project for which the steer phase was previously reported by Phillips et al. (E. S. R., 88, p. 181), comparison of 55 Hereford heifers and 53 F_1 Shorthorn × Hereford heifers from random-selected Hereford cows showed that from growth and weights of the heifers to 30 mo. of age the crossbred calves were significantly heavier at birth, weaning, 18 mo., and 30 mo., and made significantly greater gains to weaning than the Herefords. There was a mean difference of 87.9 lb. at 30 mo.

of age. The score for beef type of the crossbreds was superior to the purebreds at the conclusion of the experiment.

Changes in the physiology and pharmacology of the uterine muscle of the cow in relation to the estrous cycle, P. T. Cupps and S. A. Asdell. (Cornell Univ.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 351–359, illus. 1).*—Studies were made of the motility of the uterine musculature and the size of the cells of the uteri removed from 10 heifers and 1 multiparous cow at various stages of the estrous cycle. Sections of the muscle cells were studied microscopically and the motility ascertained before and after addition of the various drugs by connecting strips of the tissue with a kymograph. The length of isolated muscle cells removed from different parts of the uterus and macerated in nitric acid was ascertained. About 300 cells were measured from each preparation. A few appeared to have two nuclei and a few were split, but only those which were tapered at both ends and contained a nucleus were measured. Spontaneous motility consisted of strong contractions of great amplitude at intervals of 1½–2 min. and small contractions at 20–30-sec. intervals. The latter increased in importance during metestrum. In early diestrum long rhythmic changes of tone also occur. "Pituitrin, arecolin, and lentin produce strong tonic contractions at all stages of the cycle. Eserine, gynergen, and pilocarpine have very irregular effects and are mainly inert. Atropine rarely produces an inhibitory effect. Epinephrin is inhibitory during and shortly after the estrogenic phase, and motor during the progestational phase. The cow thus falls into . . . the 'cat' group in respect to this effect. The muscle cells of the uterus grow in length during the estrogenic phase and decrease in length during the rest of the cycle. The growth impulse starts at the apices of the uterine horns and travels caudally. It is over at the apices earlier than it is in the rest of the tract."

Differences in frequency of cellular antigens in two breeds of dairy cattle, R. D. Owen, C. J. Stormont, and M. R. Irwin. (Univ. Wis. coop. U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 315–321).*—The frequencies of 30 cellular antigens of cattle as described by Ferguson et al. (E. S. R., 87, p. 854) were determined, 18 of the antigens being significantly more frequent in 569 Guernseys, 5 more frequent in 513 Holsteins, and 7 not significantly different in the two breeds. There was a marked tendency for the percentage frequency of an antigen in one breed to agree with its relative position in the other breed. The two breeds are not distinguished by any single antigen, but the breed differences are mainly quantitative for most of the antigen frequencies. There seems little doubt that the breed differences result from contrasting gene frequencies among genes common to the two breeds. It appears that under selection individuals identical in blood type may be produced by either breed.

The optimum emphasis on dams' records when proving dairy sires, J. L. Lush. (Iowa Expt. Sta.). *(Jour. Dairy Sci., 27 (1944), No. 11, pp. 937–951, illus. 3).*—Nearly all sire indexes yet proposed are special cases of a general class described by the formula $I = a + c\ (X - bY)$, in which X is the average record of the daughters of the sire and Y is the average record of the dams of those daughters, a and c are constants which determine the mean and the variability of a group of indexes, while b determines the relative emphasis on daughters and on their dams. From the principle of multiple regression it is established that, for the index to have maximum accuracy, b should equal the regression of X on Y or be a little less than that regression if the sire's breeding value is correlated with Y. A survey of published data on the regression of X on Y in the actual proof of dairy sires indicates that this optimum value for b is not far from 0.5. Giving this optimum attention to the sire's mates should result in perhaps 15 percent more rapid progress than proving the sires on their daughters' records alone. Adjusting c in the equation will change the variability (and perhaps the convenience) of the index, but not its accuracy for comparing sires with each other.

A new method for indexing dairy bulls, V. A. RICE. (Mass. State Col.). *(Jour. Dairy Sci., 27 (1944), No. 11, pp. 921–936, illus. 1).*—In nearly 50,000 comparisons of dams' and daughters' production in 5 dairy breeds, the individual regression of daughters on dams was of the order of about 0.3 for milk production and 0.45 for butterfat test. Group regression of daughters on dams were of the order 0.5 to 0.6 for both amounts of milk and butterfat tests. The variability of these conditions was reduced about 30 to 50 percent when the data were treated in groups with common environmental conditions as is done in indexing bulls. The "NEW" sire index suggested is based on the sum of the difference between a sire's daughter's actual and normally expected production and the breed average. The formulas for several indexes are presented as follows for comparison:

$$\text{EP (equal parent)} = d + d - m$$
$$\text{Norton} = d + d - e$$
$$\text{NEW} = w + d - e$$

in which d = daughters' production, m = dams' production, e = daughters' expected production, and w = average of the breed. It is the author's opinion that the NEW bull index should be (1) sound from a genetic standpoint, (2) easily arrived at and understandable, (3) calculated in terms of the breed average, (4) comparable in variability to groups of animals rather than to individuals. It should provide a rank of bulls and a definite measuring stick for transmitting performance, a means for predicting future daughters' production, and an accurate means for evaluating pedigrees. It appears that the method makes pedigrees look more nearly like what they are genetically than does the equal-parent method.

Wanted—an improved sire index, V. A. RICE. (Mass. State Col.) *(Holstein-Friesian World, 41 (1944), No. 21, pp. 17, 36, 42, 54–55, 58, illus. 1).*—Essentially noted above.

What the new bull index can do, V. A. RICE. (Mass. State Col.). *(Holstein-Friesian World, 41 (1944), No. 24, pp. 14–15, 63).*—Superiority of the NEW sire indexing method noted above over the equal parent method is pointed out.

'**Horn and scur inheritance in certain breeds of sheep,** H. L. IBSEN. (Kans. Expt. Sta.). *(Amer. Nat., 78 (1944), No. 779, pp. 506–516).*—In discussing the inheritance of horns and scurs in several breeds of sheep, in a continuation of previous studies (E. S. R., 83, p. 756), it is postulated that all sheep are homozygous for the genes for horns. The gene *P* for polled is epistatic to *H*. The gene for horns (*Hm*), a modifier of the above condition, has a different effect in the two sexes, thus a *ppHHhmhm* male is horned and a female hornless. Both sexes are horned when the animal has the dominant form of this modifier. *P* is epistatic to both *Hm* and *hm*. The gene for scurs (*Sc*) is epistatic to *P*, but when heterozygous it expresses itself only in the male. In horned animals *Sc* is hypostatic. Another gene for horns (*Ha*) is epistatic to *P* and hypostatic to *Sc*. A *PpHHScscHaha* male would be scurred, while a *PpHHscscHaha* male would be horned. Another scur gene (*Sr*) was also found in Rambouillet females. A gene (*Su*) permits the horn gene *Ha* to express itself in heterozygous females. Another gene (*Pe*) postpones the expression of *Sc* in males.

Heritability of type in Poland China swine as evaluated by scoring, H. O. HETZER, G. E. DICKERSON, and J. H. ZELLER. (U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 390–398, illus. 1).*—Study was made of the scores of 731 pigs representing 210 litters sired by 32 boars from 106 sows. The litters were 40 from a small type Poland China strain, 75 from intermediate, 78 from large type, and 17 from crosses between strains. The pigs were farrowed in 14 seasons, but the average scores differed little between seasons. They were scored at 225 lb. live weight in the first 10 seasons, but at the same degree of finish during the last 4 seasons. The small type strain consisted of short-bodied and low-set animals, slow in reaching sexual maturity. The intermediate type tended to have more length of body and well finished at an early age. Pigs of the large type were still longer body and legs. The scores adopted ranged from 1 to 9.

The analysis of variance was used to determine the importance of differences (1) between seasons within strains, (2) between the three types within seasons, (3) between the progenies of sires within the same strain and season, (4) between the litters of the same sires within the same strain and season, and (5) between litter mates. Only the mean squares of differences between litters of the same sire and between full-sib litters were properly to be compared with the intralitter mean square. Differences between sire progenies within strain and seasons fell just short of the 5 percent level of significance. The differences between the litters in the three type strains were highly significant. Calculated variance due to different hereditary and environmental conditions showed that the fraction of variance within strain and season accounted for by heritable differences in the pigs was estimated at 38 percent.

Nonheritable differences among litter mates accounted for 57 percent of the variance, while temporary or permanent differences in litter environment caused only 5 percent of the variance. The heritable fraction of intraseason variance between pigs in different strains was estimated at 92 percent. There was little effect of seasonal differences in environment on the scores—about 4 percent. Differences in type generally existing between small-, intermediate-, and large-type herds of swine are due largely to differences in heredity. The heritability of type is apparently high enough for selection to be effective in changing the type rather rapidly within individual herds. Selections of breeding animals from herds in which type is more extreme in the desired direction makes more rapid progress possible than within the breeder's own herd.

A study of the predictive value of scores on body conformation of pigs taken previous to final score, L. M. Winters and W. W. Green. (Minn. Expt. Sta. coop. U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 399–405).*—Correlation coefficients were calculated between the scores of 417 gilts when 112 days of age and at 200 lb. in weight or 180 days of age in 5 herds. All were significant at the 1-percent level, and in all except 1 herd there was a considerable margin in the prediction index calculated by methods of Treloar (E. S. R., 84, p. 718), both of which would indicate that a satisfactory job of selection could be done at 112 days of age. The average value of *r* and the prediction index were 0.60 and 0.20, respectively, for the 5 herds. A total of 124 boars was scored in somewhat more detail at 112 days, 140 days, and at the completion of the trial for the animal as a whole, body length, body depth, ham, quality, and feet and legs, in accord with the methods of the U. S. D. A. Regional Swine Breeding Laboratory. Although the correlations were high, the prediction values were so low as to be not at all encouraging. The correlations between the body depth, ham, and total score at 112 and 140 days were over 0.50, but the others were all less at these two ages. Correlations between the other characters at 112 days and when finally recorded were still smaller and the prediction values were disappointingly low.

Preliminary report on crossing of inbred lines of swine, L. M. Winters, P. S. Jordan, R. E. Hodgson, O. M. Kiser, and W. W. Green. (Minn. Expt. Sta. coop. U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 371–379).*—Crosses within and between breeds showed an increase in vigor in every item of comparison. In 12 of 13 crosses (8 lines within Poland Chinas and 5 between breeds) there was more vigor than the average of the parental lines. There was an increase in vigor of the pigs associated with the decrease in inbreeding. Line crosses between breeds, as measured by fertility, survival, rate of gain, economy of gain, and score for body conformation, were employed in these comparisons. Crosses between breeds were more effective than crosses between lines within the same breeds. An advantage was shown for genetic diversity between stocks. Superior lines seemed to produce superior crossbreds. Crossed lines showed an advantage over crosses of inbreds in the number of pigs weaned, weaning weights, rate of gain, and 180-day weights. The study was based on 249 pigs produced by crossing inbred Poland China lines, 1,105 Poland China inbred pigs, 94 pigs from crosses of different breeds, and 1,509 inbred pigs in 3 breeds.

The relationship between certain blood components and rate of growth in swine, A. W. Nordskog, R. E. Comstock, and L. M. Winters. (Minn. Expt. Sta. coop. U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 422–430).*—Comparison of the red cell counts, hemoglobin, serum protein, and catalase activity of a total of 45 pigs in 5 inbred lines produced in connection with the U. S. D. A. Regional Swine Breeding Laboratory showed that the level of these blood constituents was higher at 112 days than at 84 days of age. Significant differences were demonstrated between lines for red cell counts and catalase adjusted for hemoglobin concentration. Differences between litters were not significant, but litter differences plus the interaction, age × litters, were significant for all of these blood constituents. In a second experiment, correlation was made at 112 and 168 days of the hemoglobin and serum protein with rate of gain from 56 to 112 days and 114 to 168 days, respectively, for 136 spring pigs in 49 litters from 7 lines. These results showed that growth up to time of sampling was related to the hemoglobin and serum protein, but growth following sampling was not related to these constituents. Gains from 56 to 112 days showed a correlation coefficient of 0.63 with gain from 114 to 168 days. Correlation between the two blood proteins was about 50. Correlation of the blood components was smaller with gains at 114 to 168 days than at 56 to 112 days.

A comparison of the effects of inbreeding and selection on performance in swine, R. E. Comstock and L. M. Winters. (Minn. Expt. Sta. coop. U. S. D. A.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 380–389).*—Study was made of the factors responsible for the merit of inbred lines. In data on 337 litters produced at the Minnesota Station through 1942 (E. S. R., 89, p. 198), the regression of average daily gains on inbreeding was —0.0027 ± 0.0010 lb. There was a decrease of an average of 0.037 pig per litter with each percent increase in the inbreeding of both the dam and the litter. There were considerable errors in these estimates, but the actual results were in substantial agreement with the estimates. Litter size seemed more difficult to maintain in inbred lines than growth rate, which is in agreement with other published results by Hetzer et al. (E. S. R., 84, p. 172). Maximum selection seemed to be necessary for the maintenance of litter size in the development of inbred lines. All factors contributing toward the efficiency of performance are affected by other than genetic factors, as for instance (1) the age of gilt at first farrowing affects first litter size about one-third live pig for 1 month's deviation from 12 mo. of age, (2) pigs out of sows average about 4 lb. heavier than pigs out of gilts throughout the postweaning test period, and (3) feed requirements increase with increased weight at weaning.

A comparative study of epididymal and ejaculated spermatozoa of the boar, J. F. Lasley and R. Bogart. (Mo. Expt. Sta.). *(Jour. Anim. Sci., 3 (1944), No. 4, pp. 360–370, illus. 5).*—The percentage of live sperm removed from the epididymis of 20 boars was studied after 6 and 16 days' storage and compared with the percentage of live sperm in semen ejaculated into an artificial vagina just before castration. Live spermatozoa were determined by the opal blue-eosin technic described by Lasley et al. (E. S. R., 87, p. 500). For storage 1 cc. samples of semen and of suspended spermatozoa were placed in 4-cc. vials, corked tightly, and sealed with paraffin and placed in a beaker containing 300 cc. of water set in a refrigerator at 10°—12° C. The samples were warmed to 35° for testing. Motility was ascertained with low power. At the end of 6 days' storage 75 percent of the epididymal sperm were alive, but only 44.8 percent of normal ejaculated sperm survived to this time. After 16 days' storage 51.2 percent of the epididymal sperm and 9.6 percent of the normally ejaculated sperm survived. An attempt was made to discover the reasons for this difference in viability, and it was found that the chief morphological difference was the presence of a protoplasmic droplet on the midpiece of epididymal spermatoza. Sperm from different parts of the epididymis showed differences in the location of this droplet. The protoplasmic droplet was only on a small part of the ejaculated sperm, and this on the posterior portion of the midpiece. There was only slight motion in spermatozoa from the epididymis, whereas ejaculated sperm were highly motile. Semen added to epididymal sperm increased its motility. Approximately 15 percent of the sperm died in their passage from the epididymis to ejaculated semen. An average of 65 percent of the sperm from the tail of the epididymis survived to 10 min. at 0° as contrasted with survival of only 12.5 percent of sperm in the semen. Sperm showing bent tails were thought to be undeveloped and may result from overuse of the male or disturbance in spermatogenesis.

The prenatal growth of the cat.—XIV, The weight of the skeleton in the fetal and in the adult cat, H. B. Latimer (*Growth, 8 (1944), No. 2, pp. 149–158, illus. 1)*.—Continuing this series (E. S. R., 90, p. 174), the skeleton decreases from its maximum of 18 percent of the body weight in the smallest fetal cat to about 12 percent in the newborn kitten, with a slight increase thereafter.

A case of hermaphroditism in the mouse, E. Fekete and L. B. Newman *(Yale Jour. Biol. and Med., 17 (1944), No. 2, pp. 395–396, illus. 1)*.—On anatomical and histological examination of the genitalia, a mated mouse which had not gotten females pregnant, was found to have both gonads in the abdominal cavity. Microscopic examination of the right gonad showed it to be an ovotestis. The left testis was a typical cryptorchid testis with small, loosely arranged seminiferous tubules. This is said to be the sixth case of hermaphroditism that has been described in the mouse.

Are crossbred chickens really better? R. N. Shoffner (*Minn. Farm and Home Sci. [Minnesota Sta.], 2 (1944), No. 1, pp. 14–15, illus. 1)*.—The progeny of reciprocal crosses between White Leghorn, New Hampshire, and White Plymouth Rock breeds were found to excel purebreds in vigor, as exemplified by about 11 percent in hatchability, laid about 15 more eggs per hen to 500 days of age, and egg production by the crossbreds started at younger ages. The increased vigor makes crossbreds preferred for broiler production, and mortality in the laying flock is reduced to a minimum. Crosses of White Plymouth Rocks and White Leghorns were not much superior to purebreds, and certainly less than crosses between White Leghorns and New Hampshires or White Plymouth Rocks and New Hampshires. In any case, the quality of the crossbred was dependent on the quality of the purebred parent strains, which were usually greater from crossing unrelated stocks. The main disadvantages of crossbreeding are: (1) To produce crossbreeds it is necessary to maintain two purebred flocks; (2) egg color of crossbreds may be objectionable because it is intermediate between the parents; and (3) some crossbreds have an excess of broodiness. Not all crossing is advantageous, but except for eggshell color, crossing of males of the heavy breeds with White Leghorn females was advantageous. Crosses between heavy breeds circumvent the eggshell color problem, but the plumage color may be variable. Considering all factors, crossbreds may not be expected to surpass the very best purebred strains unless the better purebreds are used for the parents.

Studies of genetic viability in the fowl, C. D. Mueller (In *Cornell University Abstracts of Theses, 1943. Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 287–290)*.—Data on viability, disease resistance, and egg production among 26,609 pedigreed chicks group into families, as previously reported by Hutt et al. (E. S. R., 92, p.

197), are presented in four parts, (1) the consistent performance of sires and dams in different years, (2) the number of daughters necessary to test a sire or a dam, (3) the relation of duration of life in parents to viability of daughters, and (4) viability among adult fowls in relation to viability previous to the age of sexual maturity. A plan for selecting for desired qualities consisted chiefly of obtaining tests of performance of progeny of a large number of pullets and cockerels, viability and egg production of families and close relatives, and duration of life of parents and collateral relatives as a criterion of viability and in selecting families of pullets at housing time.

Methods of breeding chickens for high egg production.—I, Applying the progeny test to a small flock, F. P. Jeffrey *(New Jersey Stas. Bul. 714 (1944), pp. 8)*.—The results in egg production, hatchability, and mortality of selected and unselected lines from 1936 to 1941 showed that by progeny testing with 6 males and 27 female breeders each year over a 6-yr. period, considerable improvement in hatchability of fertile eggs and in egg production was obtained. Of the 34 males tested in the study, only 1 proved to be superior in regard to egg production. However, this sire carried factors for small egg size, and after improving for egg production the line ended with small egg size. More than 6 males must be progeny tested each year to improve the flock in a variety of characters. Laying-house mortality declined from 41 to 13 percent in the unselected line over the 6-yr. period, but only from 29 to 18 percent in the selected line. In the conduct of the work, the selected stock was carried each year with 27 females in laying cages artificially inseminated by the 6 males. The unselected stock consisted of 40 pullets flock-mated with 3 males. The egg production was increased from 84 per year in the selected line and 82 in the unselected line to 164 and 152, respectively. Laying cages were an economical method for progeny testing.

Poultry-breeding-stock selection for desired characters, A. B. Godfrey *(U. S. Dept. Agr. Cir. 715 (1944), pp. 8, illus. 1)*.—Selecting breeding stock on the basis of total score is much more progressive than selecting for a single character at a time. However, selection to independent culling levels permits earlier culling because selection can be made for each character at the time the birds are handled on the range. In selecting on the basis of total score, the characters should be weighed in accordance with their economic importance and their heritability. It is suggested that all breeding birds be graded into three breeding classes, for example, excellent, satisfactory, and poor, on the basis of all characters that can be observed or measured at each of the selection periods. The individual production and brooding records of 25 Single-Comb Rhode Island Red hens are presented.

Effect of hypophysectomy of growing chicks, A. V. Nalbandov and L. E. Card. (Univ. Ill.). *(Jour. Expt. Zool., 94 (1943), No. 3, pp. 387–413, illus. 12)*.—Continuing this study of the effects of hypophysectomy on the growth of chickens (E. S. R., 88, p. 377), 7 of 60 chicks died during or within a few hours after the operation, and 16 were incompletely hypophysectomized. Of the remaining 37 birds, 70 percent died within 1 to 30 days after the operation and 30 percent lived from 31 to 374 days. The normal temperature of hypophysectomized chickens was 41° C., while that of the controls was 42°. The increase in body weight following hypophysectomy was due to the abnormal deposition of fat rather than true growth. The carcasses of pituitaryless chickens contained five to seven times more fat than the controls, and there was a slight increase in length of the long bones. The blood fat (measured as oleic acid of the plasma) was not higher than the blood fat of normal birds. There was possibly an increase in the storage of bile. Study was also made of the histology of the thyroids, adrenals, and other glandular tissues.

Effect of colchicine on mitosis in the neural tube of the forty-eight hour chick embryo, T. M. Woodard, Jr., and S. B. Estes *(Anat. Rec., 90 (1944),* *No. 1, pp. 51–54)*.—Chick embryos of 48 hours' incubation were opened and treated with 1 mg. of colchicine and allowed to continue development up to a maximum of 3 hr. when the average mitotic index was 20.5 percent. Each phase of mitosis except the metaphase declined. The rise in the metaphase is accounted for in terms of the accumulation of nuclei. It is concluded that the concentration of colchicine acts only in this way and is not a mitotic stimulant.

Studies in the genetics of Drosophila, II, III, directed by J. T. PATTERSON *(Tex. Univ. Pubs. 4228 (1942), pp. 200, illus. 46; 4313 (1943), pp. 327, illus. 170)*.—Two further contributions (E. S. R., 87, p. 363) are included.

II. *Gene variation and evolution*.—This installment contains the following papers: Inter-specific Hybridization in the Genus *Drosophila*, by J. T. Patterson (pp. 7–15); Heterosis in *Drosophila hydei*, by W. S. Stone (pp. 16–22); Analysis of the *repleta* Group of *Drosophila*, by L. T. Wharton (pp. 23–52); Cross Fertility and Isolating Mechanisms in the *Drosophila mulleri* Group, by J. F. Crow (pp. 53–67); Relationships in the *melanica* Species Group, by A. B, Griffen (pp. 68–73); Genetic Relationships in the *Drosophila funebris* Group, by G. B. Mainland (pp. 74–112); A Study of Intersexes Produced by a Dominant Mutation in *Drosophila virilis*, Blanco Stock, by W. W. Newby (pp. 113-145); The Ix^B Factor and Sex Determination, by W. S. Stone (pp. 146-152); Distribution of the *virilis* Group in the United States, by J. T. Patterson (pp. 153-161); and Genetic and Cytological Analysis of the *virilis* Species Group, by J. T. Patterson, W. S. Stone, and A. B. Griffen (pp. 162-200).

III. *The Drosophilidae of the Southwest*.—Herein are brought together the more important facts on the various species of *Drosophila* known to occur in the southwestern United States and northern Mexico. The "Southwest" here used includes the area embracing the States of Texas, Oklahoma, New Mexico, Colorado, Arizona, Utah, Nevada, and California and the Mexican States of Tamaulipas, Nuevo Leon, Coahuila, Chihuahua, Sonora, and Baja California. The following papers—including new taxonomy—make up this volume: The Drosophilidae of the Southwest, by J. T. Patterson (pp. 7–216); Geographical Distribution of Species of the Genus *Drosophila* in the United States and Mexico, by J. T. Patterson and R. P. Wagner (pp. 217–218); and Analysis of the Metaphase and Salivary Chromosome Morphology Within the Genus *Drosophila*, by L. T. Wharton (pp. 282–319). A subject index is provided.

FIELD CROPS

[Field crops research] *(Jour. Amer. Soc. Agron., 36 (1944), No. 12, pp. 988–995, 995–1003, 1014–1015, 1016–1017, 1019–1020, 1021–1023, 1024)*.—Papers concerned with different phases of field crops investigations, which were to have been presented at the annual meetings of the American Society of Agronomy and the Soil Science of America in 1944, and published in abstract form in these pages included: Gamete Selection in Corn Breeding, by L. J. Stadler (pp. 988–989) (U. S. D. A.); Recurrent Selection for Specific Combining Ability in Corn, by F. H. Hull (pp. 989–990) (Fla. Expt. Sta.); The Value of Self-compatibility in Breeding White Clover, by S. S. Atwood (p. 990) (Cornell Univ.); Intra-varietal Crossing in Wheat, by J. B. Harrington (pp. 990–991); Inheritance and Interaction of Genes Governing Reaction to Stem Rust, Leaf Rust, and Powdery Mildew in a Spring Wheat Cross, by D. G. Wells and S. P. Swenson (pp. 991–992) (Wash. State Col.); Nitrogen Fertilization of Bermuda Grass Pastures, by O. E. Sell (p. 992) (Ga. Sta.); The Improvement of Carpet Grass Pastures by Fertilization and Seeding to Clover, by E. L. Mayton (p. 993) (Ala. Sta.); Some Factors Affecting Pasture Production in Western North Carolina, by W. W. Woodhouse, Jr. (p. 993) (N. C. Sta.); Some Experiences in Revegetating Poor Hill Land Pastures in West Virginia, by R. M. Smith, G. G.

Pohlman, F. W. Schaller, and D. R. Browning (p. 994) (Univ. W. Va.); Critical Phosphorus and Potassium Levels in Ladino Clover Plants, by A. Ulrich (p. 994) (Univ. Calif.); Grass-Legume Hay Response to Various Fertilizer Ratios, by A. Rich and B. E. Gilbert (pp. 994–995) (R. I. State Col.); Agronomy, a Phase of Military Engineering, by R. H. Morrish (pp. 995–996); Yields From Single-Plant Hills vs. Multiple-Plant Hills at the Same Population of Corn Plants Per Acre, by G. H. Dungan (p. 996) (Univ. Ill.); Alfalfa and Grass Percentage Determinations With the Inclined Point Quadrat Apparatus at Different Stages of Development of the Mixtures, by A. C. Arny (pp. 996–998) and The Development of a Synthetic Variety of Corn From Inbred Lines, by H. K. Hayes, E. H. Rinke, and Y. S. Tsiang (pp. 998–1000) (both Univ. Minn.); Winter Injury and Persistence in Alfalfa, by F. R. Jones (p. 1000) and Some Problems in Testing Selected Strains of Forage Plants in Pasture Trials, by H. L. Ahlgren (pp. 1000-1001) (both Univ. Wis.); A Selection Experiment with Kentucky Bluegrass, by H. K. Hayes and H. L. Thomas (pp. 1001–1002) (Univ. Minn.); Methods of Evaluation of Red Clover Strains Grown Alone and With Timothy in Small Plots, by J. H. Torrie and J. L. Allison (pp. 1002–1003) (Wis. Sta.); Evaluation of Strains of Kentucky Bluegrass in Association With White Clover, by W. M. Myers and V. G. Sprague (p. 1003) (U. S. D. A.); The Nature of the Flora on Field-retting Hemp, by W. H. Fuller and A. G. Norman (p. 1014–1015) and Comparative Effects of Plowing and Other Methods of Seedbed Preparation on Nutrient Element Deficiencies in Corn, by C. A. Bower, G. M. Browning, and R. A. Norton (p. 1016) (both Iowa State Col.); The Response of Various Forage Grass and Legume Seedlings to Phosphate Fertilization Under Greenhouse Conditions, by R. R. Robinson (pp. 1016–1017) (U. S. D. A.); The Response of Hemp to Fertilizers in Iowa, by C. A. Black and A. J. Vessel (pp. 1019–1020) (Iowa State Col.); Nitrogen and Phosphorus Levels in Relation to Potato Yields During Dry Seasons, by R. L. Carolus and W. G. Woltz (pp. 1021–1022) (Va. Truck Sta.); The Effect of Different Levels of Nitrogen, Phosphorus, and Potash Applied at Different Times During the Growing Season on the Yield of Sugar Beets and the Nitrogen Content of Sugar Beet Tops, by J. F. Davis, W. D. Baten, and R. L. Cook (p. 1022) (Mich. State Col.); Nitrogen Fertilizer Experiments With Flue-Cured Tobacco on Granville Sandy Loam, by W. Husmann (pp. 1022–1023) (Va. Sta.); and The Use of Some Zinc Compounds in Sprays for Potatoes on Muck Soil, by N. K. Ellis (p. 1024) (Purdue Univ.).

[Farm crops research in Mississippi] (*Miss. Farm Res.* [*Mississippi Sta.*], *7 (1944), Nos. 11, p. 8; 12, pp. 4, 5, illus. 1).*—Progress of experiments with field crops and related research is reported in the following articles: No. 11, Fertilization the Most Important Pasture Practice, by H. W. Bennett (p. 8); No. 12, A Study of the Cotton Root System, by O. A. Leonard (p. 4); Winter Legumes and Fertilizer for Cotton Production, by J. Pitner (p. 4); and Liming Increases the Yield of Seed Cotton in Test on an Upland Brown Loam Soil, by C. D. Hoover (p. 5).

[Field crops theses] (In *Cornell University Abstracts of Theses, 1943, Ithaca, N. Y.: Cornell Univ. Press, 1944, pp. 330–332, 403–405, 411–414).*—Abstracts are given for theses entitled: Quantitative and Qualitative Inheritance in Barley, by S. Dasananda; Birdsfoot Trefoil (*Lotus corniculatus*), by H. A. MacDonald; and Effect of Competition on Emergency Forage Crop Technic, by D. L. Van Horn.

Field crops of India, with special reference to Mysore, A. K. YEGNA NARAYAN AIYER *(Bangalore: Govt. Press, 1944, pp. 552+, illus. 79).*—Practical information on fields crops of importance in India is presented in chapters covering distribution, soils, rotations, cultural and harvesting practices (mainly those prevalent in Mysore), yields, botany and varieties, pests and diseases, chemical composition, and production and trade, and grouped in sections dealing with grains; legumes; oil seeds; sugarcane; food crops (bananas, potatoes, tapioca); condiments and spices; fiber crops; tobacco, coffee, tea, and narcotics; medicinals; dyes; and special products (mulberry and silk, and Para rubber). An index is included, together with a glossary, and appendixes on manures and fertilizers and insecticides and fungicides.

A study of the reliability of range vegetation estimates, A. D. SMITH. (Utah Expt. Sta.). *(Ecology, 25 (1944), No. 4, pp. 441–448).*—The accuracy and extent of variation between individual estimates of vegetation density and the effect of a training period on the uniformity of estimates were studied in 1939 on ungrazed sagebrush, winterfat, and grass vegetation types by a crew of eight men. Density estimates were not shown to be a highly reliable measure of range value since "high" estimators found ranges to have almost twice the grazing capacity found by "low" estimators, even after a week of intensive training. A significant difference was found between individuals and also a given individual had significant inter- and intradaily variation. Plants showed great variations in yield from a unit of density both within and between species. The results supported the current tendency among range technicians to rely less upon density estimation as a means of determining grazing capacity of ranges, and more upon comparison with ranges of known productivity and a general ecological analysis of plants and soil followed by percentage adjustments in current stocking.

Reseed range land to increase grazing capacity and produce more beef per acre, C. H. WASSER *(Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 5, pp. 12–14, illus. 2).*—Adapted species and mixtures of grasses and legumes listed for reseeding range on the plains, lower mountainous and foothill plains, and the mountainous region, and the dates, rates, and methods of seeding indicated are based on results of station experiments in different localities in Colorado.

Better pastures for dairy cattle, W. B. NEVENS *(Illinois Sta. Bul. 505 (1944), pp. 227–271+, illus. 34).*—Pasture experiments 1935–42 were made to develop a system which would supply ample forage in midsummer, to evaluate certain legumes and grasses and a mixture for pastures, and to increase the yield and protein content of Kentucky bluegrass.

Bluegrass usually has not been satisfactory in central Illinois for use as the only pasture crop because of low yields and low feeding value during midsummer. These faults could be overcome somewhat by good management practices as fertilizing heavily, beginning grazing only after good growth of grass, removing cattle early in autumn, and removing large perennial weeds. More and better forage could be obtained more effectively from the same area of pastureland, by use of several crops, as winter rye, bluegrass, alfalfa, a Sudan-soybean mixture, bromegrass, and sweetclover—in rotation. The mixture has made high-yielding and drought-enduring midsummer pasture. Winter rye has been ready for grazing 1 to 2 weeks earlier than bluegrass, and bromegrass several days earlier. In seasons of low rainfall, the rotational system provides pasture longer than bluegrass.

Pasture planted first to winter rye and then to a Sudan grass-soybean mixture usually has yielded much higher than pasture planted to one crop only, but the forage supply has not been continuous. While both have outyielded bluegrass, alfalfa needs reseeding oftener and bromegrass recovers more slowly from close grazing. Pasture crops evidently should be rated on feeding value, palatability, economy of production, timeliness of yield, length of pasture season, resistance to drought, weeds, and tramping, likelihood of causing bloat or other upsets, and adaptability to soil and climate, as well as on total yield.

Fertilizing with urine, in addition to manure, has increased yield, protein content, and palatability of bluegrass. Urine-treated grass has had a consistently lower dry-matter content than untreated. A close relation between low dry-matter content (high moisture content) and palatability was apparent. As bluegrass, bromegrass, and winter rye have developed, their dry-matter, lignin, and cellulose contents have risen. At the same time, protein content gradually has declined until the forage contains only about half as much as at the beginning of the season. Bromegrass, winter rye, and the Sudan-soybean mixture made good pastures because of low weed content and high yields. The weed content of bluegrass pastures did not decline despite good management for 8 yr.

Improving bluegrass pastures, W. B. NEVENS (*Illinois Sta. Bul. 504 (1944), pp. 215–224+, illus. 3*).—Kentucky bluegrass pasture plats variously treated, disked, and manured were harvested by mowing weekly or every 2 weeks, and an untreated plat twice a year 1909–13. Bluegrass harvested weekly had a slightly higher percentage of protein than that mowed biweekly and a slightly smaller annual yield of dry matter, but the total amount of protein did not differ significantly. Double disking once in the spring increased the yearly yield of dry matter considerably, increased the percentage of protein to a small extent, but did not change the total amount of protein significantly. Application of manure more than doubled the yearly yield of dry matter, increased the protein percentage in the dry matter by one-sixth, and nearly trebled the total amount of protein. Yields declined when grass was harvested over a period without return of fertility to the soil.

Manure is best pasture improver, D. M. SEATH and L. L. RUSOFF (*Dairy Res. Digest* [*Louisiana Sta.*], *2 (1944), No. 4, p. 1*).—Pasture experiments in three parishes over 3 yr. demonstrated the merits of manure either in establishing new pasture or renovating an old one. Definite improvement in stands of clovers and grasses followed application of manure + P or + Ca PK.

Fertilizing to increase the yield and longevity of alfalfa in Georgia, L. C. OLSON (*Amer. Fert., 101 (1944), No. 11, pp. 28, 30*).—Fertilizer tests by the Georgia Experiment Station, 1942–43, indicated that lack of potash is one of the principal reasons why alfalfa stands cannot be maintained. Cultural and fertilizer practices are outlined.

The alfalfa seed production problem. (Coop. U. S. D. A.). (*Farm and Home Sci.* [*Utah Sta.*], *5 (1944), No. 4, p. 3, illus. 3*).—Since alfalfa flowers must be tripped to obtain a good seed set and the tripping agents found in Utah alfalfa are honeybees and wild bees which nest in or on the ground, seed growers are encouraged to keep honeybees near alfalfa fields and to protect nesting places of wild bees and apply insecticides carefully. Cutting weeds lessen the competition for pollen-collecting insects. Regulation of irrigation practices to avoid rank growing succulent alfalfa may reduce injury from lygus bugs. The foregoing practices are based on findings by J. W. Carlson, C. J. Sorenson, et al.

Mars—A new high-yielding barley for Minnesota growers, M. T. HENDERSON and J. J. CHRISTENSEN (*Minn. Farm and Home Sci.* [*Minnesota Sta.*], *2 (1944), No. 1, pp. 4, 12, illus. 1*).—Mars barley, a productive early, six-rowed, smooth-awned variety introduced in 1944, has very strong straw with a record of less than one-fourth as much lodging as in Wisconsin Pedigree 38 and averages 3 to 4 lb. per bushel heavier. It is resistant to stem rust and moderately resistant to spot blotch, but is susceptible to scab and loose smut. Because of low diastatic power, it may not be entirely satisfactory for malting. Mars was produced in cooperation with the U. S. Department of Agriculture et al. from a cross made in 1931 between Minnesota 462 and Peatland barleys. Seed was not expected to be available for general distribution until 1946.

Canaigre investigations, I, II. (U. S. D. A. and Tex. Expt. Sta.). (*Jour. Amer. Leather Chem. Assoc., 39 (1944), No. 12, pp. 467–479, illus. 2; pp. 479–491, illus. 5*).—Two papers of the series are presented.

I. *A review and preliminary report,* J. S. Rogers and G. A. Russell.—Samples of wild roots of canaigre collected from 12 locations in four Southwestern States ranged in tannin content from 9.0 to 32.1 percent. In 25 samples collected near Las Cruces, New Mex., tannin ranged from 11.2 to 35.3 percent and total sugars from 8.1 to 19.6 percent. Tannin contents of roots of the same age and from the same hill varied as much as 3.1 percent, significantly less than variation of averages representing different hills. Analyses of bodies of roots could be used to determine whether corresponding crown portions, taken for planting, represent high-, medium-, or low-tannin strains. The program for cooperative investigation of canaigre (*Rumex hymenosepalus*) as a source of tannin is outlined, and the early history of canaigre is briefly reviewed. The plant and roots are described, and its habitat is given.

II. *Dehydration of bulk lots of canaigre roots in the locality where harvested*, G. A. Russell, J. S. Rogers, and E. C. Stevenson.—Canaigre roots could be shredded at Sacaton, Ariz., at the rate of 1 ton per hour with a shredder built in accordance with specifications of Kummer (E. S. R., 88, p. 258; 89, p. 733). Shredded roots were dried satisfactorily in the sun on asphalt and concrete in 24 hr. under climatic conditions prevailing in June 1943, when spread at the rate of 1.25 lb. per square foot. Under such conditions 1 acre of drying surface would handle 20 tons of freshly shredded roots and yield about 5.5 tons of air-dry material per day. Drying finely ground or partially pulped roots spread at rates of 10 and 5 lb. per square foot of drying floor resulted in fermentation and destruction of tannin and sugars. Satisfactory color skivers were obtained by using water extracts from the dried shredded roots.

Inheritance of strength of lint in upland cotton, J. O. Ware and D. C. Harrell. (U. S. D. A. coop. S. C. Expt. Sta.). *(Jour. Amer. Soc. Agron., 36 (1944), No. 12, pp. 976–987).*—Parental lines were grown along with F_1, F_2, and F_3, first-generation backcrosses, and second-generation backcrosses from a Florida Green Seed (E. S. R., 90, p. 31) and Rowden cotton cross for comparisons and for use in recrossing and in the backcrossing. The F_1 was repeated in the second and third years. The first backcross was made with F_1 in 1939 to both parental lines. In 1940, plants in the respective first-generation backcrosses were backcrossed again to corresponding recurrent parental plants. Florida Green Seed stock had the higher strength index, which was about 1 unit higher than in Rowden as determined by use of the Pressley strength tester. Inheritance of strength appeared to be intermediate with slight tendency to weak dominance; in repeated backcrossing the level of strength is easily shifted in either direction. Strength in F_3 progenies from plants selected out of the several F_2 class intervals did not exhibit as much uniformity as shown by either parent, but these F_3 plants tended to maintain the F_2 level of origin. In 1939 and 1941 the respective parental lines were at about the same level, but higher in 1940. In several hybrid groups the 1941 level was lower than the 1940 level. Environment was a factor and doubtless contributed to expression of variability and in changing season mean levels, yet the yearly combination or set-up permitted reliable genetic measures.

The uptake of nutrients by the cotton plant when fertilized with acid forming and non-acid forming fertilizers combined with different rates of potash, J. J. Skinner, J. G. Futral, and N. McKaig, Jr. (Coop. U. S. D. A.). *(Georgia Sta. Bul. 235 (1944), pp. 21, illus. 7).*—Profitable increases in yields of seed cotton have been produced by neutralizing the fertilizer with dolomitic limestone on most of the principal soil types of the southeastern Cotton Belt, including some soils in Georgia (E. S. R., 88, p. 739). Neutralizing the fertilizer has not materially affected the crop's requirement for K, for cotton made essentially the same yield increase regardless of the K content of the fertilizer.

The lower N percentage in Deltapine cotton plants on Clarksville gravelly loam grown with non-acid-forming fertilizers than in plants grown with acid-forming fertilizers differs from results on Tifton sandy loam, being due perhaps to differences in response to dolomitic limestone on the two soils and to the character of the soil. Fertilizers neutralized with dolomitic limestone, in general, did not materially change the composition of cotton plants (E. S. R., 88, p. 760) as compared with plants grown with acid-forming fertilizers, except in Mg content. Early availability to cotton of Mg in dolomitic limestone is indicated by the larger amount of Mg in the plants in early growth, and throughout the growing period. In addition to the N, P, and K taken up by cotton plants, large amounts of Ca and appreciable amounts of Mg were absorbed. The larger plants with increased yields produced by non-acid-forming fertilizers contained larger amounts of nutrients per plant. Cotton fertilized with such fertilizer made larger and earlier growth and absorbed more nutrients per plant early in the season than plants receiving an acid-forming fertilizer, suggesting that the limestone in fertilizers makes the nutrients more readily available.

Increasing amounts of applied K (0, 3, 6, and 9 percent K_2O) increased the K percentage in the plant and reduced the Mg percentage at all growth stages. There were consistent but small decreases in the percentages of N, Ca, and P in the plant as K applications increased, although the total amount of all nutrients per plant rose with the amount of K applied. The effect on plant composition of K was greater than that of dolomitic limestone in fertilizers with exception of the greater Mg content from dolomitic limestone. Increased rates of applied K were accompanied by increased uptake per plant of K and an increased uptake per plant of other nutrients.

Winter hardiness in guayule, J. W. Mitchell. (U. S. D. A.). *(Bot. Gaz., 106 (1944), No. 1, pp. 95–102).*—Woody outdoor seedlings of guayule not yet unacclimated to low temperatures survived temperatures only slightly lower than did very succulent greenhouse plants of the same age. Rate of cooling preceding extended exposure to low temperatures did not alter appreciably resistance to frost injury. Unhardened seedlings of four varieties withstood prolonged exposure to a temperature of 25° F. but were severely injured after 8–10-hr. exposure to 22°. Roots usually were injured severely by prolonged exposure to soil temperatures of 26°–28°. Stems and leaves of transplants were acclimated readily by low temperature hardening treatments, so that they withstood repeated exposure to 5°–10°. Stems of hardened plants of selection A-5058 (found most resistant to frost injury) withstood 3-hr. exposure to 5°. Their roots were slightly injured, but the plants survived. Experimental field plantings may readily be protected from temperatures 4° and probably lower by an adequate mulch. Rubber content of plants injured severely by frost did not differ significantly from that of comparable uninjured plants during 1–2 mo. after treatment.

The influence of depth of surface soil on potato yields, O. R. Neal. (N. J. Expt. Stas.). *(N. J. State Potato Assoc., Hints to Potato Growers, 25 (1944), No. 8, pp. [2–3, 4]).*—During 1944, potatoes made an average total yield of 184 bu. per acre on 25 farms from areas with more than 6 in. of surface soil remaining in place. Areas on the same farms having less than 6 in. of surface soil yielded 135 bu. Yield from all slightly eroded areas measured 1941–44 averaged 48 bu. per acre, 25 percent greater than that from seriously eroded areas. The value of erosion control for a long-time maintenance of soil productivity was clearly indicated.

Potato fertilization and nutrition studies in 1943, O. Smith. (Cornell Univ.). *(Amer. Potato Jour., 21 (1944), No. 12, pp. 342–355).*—Results of investigations published largely in 1943 and early in 1944, concerned with fertilizers, practices and replacements, soil amendments, and minor elements for the potato and effects of fertilizers on vitamin content, cooking quality, and diseases of potatoes are summarized, with a list of 55 titles.

Dormancy, bud growth, and apical dominance regulated by oxygen in freshly-harvested potato tubers, N. C. THORNTON (*Contrib. Boyce Thompson Inst., 13 (1944), No. 8, pp. 361–366, illus. 1*).—The dormancy of freshly harvested Irish Cobbler and Bliss Triumph potatoes was broken and bud growth obtained within 7–9 days by continuous treatment of the tubers with 2 percent of O_2 in relatively dry condition or 5–10 percent in most condition at 23°–28° C. Bud growth was produced on tubers stored in pure nitrogen for 18 days following harvest. These treatments caused the elimination of apical dominance of the buds in the apex eyes of the tuber over those in eyes at the basal or stem end; they also removed the controlling effect of the apical bud over the lateral buds of each eye so that many buds developed in every eye of the freshly harvested potato. When potatoes removed from the treatments were cut into one-eye pieces and planted in soil, vigorous multiple plants were produced from the one-eye pieces that had been exposed to reduced percentages of O_2.

Place and season effects on yields and starch content of 38 kinds of sweetpotatoes, V. R. BOSWELL, M. T. DEONIER, R. L. CAROLUS, J. B. EDMOND, O. B. GARRISON, H. L. COCHRAN, O. WOODARD, W. S. ANDERSON, J. C. MILLER, and R. E. WRIGHT. (Coop. Ga., La., Miss., S. C., Tex., Ga. Coastal Plain, and Va. Truck Expt. Stas.). (*U. S. Dept. Agr. Cir. 714 (1944), pp. 15*).—Acre yields of sweetpotatoes, starch content, and yield of starch per acre were determined 1940–42 from uniform tests in Maryland, Virginia, South Carolina, Georgia, Mississippi, Louisiana, and Texas. Tests at Onley, Virginia, were made on wilt-infested soil primarily to determine varietal reactions to wilt. See an earlier note (E. S. R., 88, p. 189).

Location and seasonal conditions at any one place have had marked effects on sweetpotatoes in the percentage of starch, total yields, and the commercial grades of roots produced. Whenever drought was serious enough to reduce greatly the yields of sweetpotato roots per acre, the percentages of starch and of total dry matter in the roots were reduced markedly. There was no consistent effect of excessive rainfall, as compared with medium or normal rainfall, upon starch and dry-matter contents of the roots. The starch content of the roots tended markedly to vary inversely with the degrees of latitude of the location where grown, but this tendency does not appear to be correlated with the rainfall, temperature, or length of growing season to which the crops were exposed for the last 4 mo. of the season. There was no clear association between starch content and soil fertility as indicated by yields.

Marked and consistent differences among varieties were evident in starch content as in yield. The relative starch content among varieties varied somewhat from year to year and from place to place, yet varietal differences were highly significant with reference to interactions of variety with season and with locality. Several seedlings, as B196 and B219, and introductions, as Wenholz 1, Wenholz 2, Director, and Wannop, were significantly superior to varieties commonly grown in the United States in starch content, yield of roots, and in quantity of starch produced per acre. Many varieties performed better in some places than in others, although a few were outstandingly good in all tests. Low-yielding or mediocre strains observed in any of the locations involved evidently can be discarded more promptly than formerly. It appears feasible to obtain superior new varieties of such wide adaptability that a multiplicity of kinds will not be needed to meet regional or local requirement.

Chlorophyll and carotene content of eighteen tobacco varieties, R. B. GRIFFITH, W. D. VALLEAU, and R. N. JEFFREY. (Ky. Expt. Sta.). (*Plant Physiol., 19 (1944), No. 4, pp. 689–693*).—The average chlorophyll concentration of 7 dark tobacco varieties calculated on a leaf-area basis was 107 percent larger than that of

11 burley varieties and their carotene content 87 percent greater, and on oven-dry weight basis these were 53 and 38 percent greater, respectively. All dark varieties averaged higher than the burleys in both pigments on leaf-area basis, but there was some overlapping in carotene on a weight basis. About half of the differences in pigment concentration of the two types may be attributed to difference in leaf thickness. The percentage of chlorophyll *a* differed little between varieties but significantly so between the earlier and later sampling dates. No correlation was found between chlorophyll or carotene contents and mosaic resistance factors. The average ratio, by weight, of total chlorophyll to carotene of all varieties studied was 19.75, very close to the ratio expected if nine molecules of chlorophyll *a* and three molecules of chlorophyll *b* were associated in the same protein group with one molecule of carotene.

Wheat varieties resistant to the hessian fly and their reactions to stem and leaf rusts, W. B. Cartwright, and R. G. Shands (*U. S. Dept. Agr., Tech. Bul. 877 (1944), pp. 6*).—A series of infestation tests were made, 1939–43, in the greenhouse and field at La Fayette, Ind., of about 3,000 domestic and foreign varieties and strains of wheat, to find those with resistance enough to hessian fly to be of value for commercial use or as parent material in breeding of fly-resistant varieties. About 6 percent of the wheats tested were found resistant. All found resistant appeared to be spring wheats except P. I. Nos. 119334 to 119358, inclusive, which have a winter growth habit. Most wheats were less infested in the field than in the greenhouse. Durums on the whole were more resistant than other varieties to hessian fly. Resistant spring wheats were especially common among introductions from Portugal, Argentina, and Uruguay. Several winter wheats moderately resistant were obtained from Turkey.

Most varieties listed were also tested for resistance to stem rust and leaf rust at Madison, Wis., in 1941 and 1942. A number showed a high degree of resistance to these rusts as well as to fly. Most common wheats tested were more or less susceptible to both stem rust and leaf rust. Five varieties from Portugal, Uruguay, and Argentina showed only traces of leaf rust, and 15 others showed only from 5 to 20 percent. Marquillo and Portugal 90 appeared to be most resistant to stem rust. Varieties of club wheat tested were more or less susceptible to both rusts and of poulard to stem rust. All durums were highly resistant to leaf rust. Certain durums appeared to offer good resistance to the hessian fly and to both leaf rust and stem rust, and may be especially useful in breeding programs.

Newthatch wheat, E. R. Ausemus, E. C. Stakman, E. W. Hanson, W. F. Geddes, and P. P. Merritt (*Minnesota Sta. Tech. Bul. 166 (1944), pp. 20, illus. 2*).—Newthatch, a hard red spring wheat, produced by crossing Hope with Thatcher and backcrossing to Thatcher twice and distributed to approved seed growers in 1944, resembles Thatcher (E. S. R., 75, p. 480) and has about the same date of heading and maturity, height, seed characters, and ability to withstand lodging. Newthatch has been resistant to both leaf and stem rusts. In the seedling stage, it proved resistant to 13 of 18 races of stem rust under test. It was outstanding in yield trials, 1941–43, being highest at University Farm and Crookston, second at Waseca, and third at Morris. In weight per bushel, Newthatch has exceeded Thatcher but was lower than Pilot, Rival, Regent, and Renown.

Newthatch has surpassed all other varieties in protein content and loaf volume, and has equaled them in yield of flour, in crumb color, grain, and crumb texture. It has a lower carotinoid pigment than Thatcher but a higher pigment content than the other varieties in the trials at the four stations. Color of the crumb of the bread has been satisfactory.

Newthatch wheat—What it is and what it took to make it, E. R. Ausemus and E. C. Stakman (*Minn. Farm and Home Sci.* [*Minnesota Sta.*], *2 (1944), No. 1,* *p. 13)*.—An account of the origin and characteristics of Newthatch, the new hard red spring wheat noted above.

Seed inspection in Kentucky, 1943–44, W. A. PRICE, M. L. DIDLAKE, E. C. VAUGHN, E. DEEN, H. TILSON, A. MCDANIEL, K. FRIED, M. MORTON, M. L. LITTELL, and L. BAUGH *(Kentucky Sta. Regulat. Ser. Bul. 40 (1944), pp. 32)*.—Germination and purity percentages and, when present, excessive quantities of noxious weed seed, are reported for 457 official samples of farm crop seed obtained from dealers during the year ended June 30, 1944.

Summary of results of seed and legume inoculant inspection for 1943, J. G. FISKE *(New Jersey Stas. Insp. Ser. 14 (1944), p. 25)*.—Dealers in New Jersey from whom 3,282 official samples of farm crop and vegetable seed and seeds mixtures were collected in 1943 are listed with compliances and violations, and vendors, crops, inoculations, and numbers of organisms are shown for 30 official samples of legumes inoculants collected in 1943.

Report on inspection of agricultural seed for 1944, L. S. WALKER and A. S. LUTMAN *(Vermont Sta. Bul. 518 (1944), p. 12)*.—Purity and germination guaranties and variations found are tabulated and discussed from tests of 325 samples of field crops seeds and forage mixtures secured from dealers in Vermont in 1944.

Weeds that may become noxious, A. H. HOLMGREN *(Farm and Home Sci. [Utah Sta.], 5 (1944), No. 4, pp. 8–9, 15, illus. 11)*.—Weeds now restricted to certain areas of Utah but potentially serious pests, described and illustrated, are nutgrass (*Cyperus esculentus*), halogeton (*Halogeton glomeratus*), field buttercup (*Ranunculus arvensis*), and madder (*Rubia tinctorum*).

Is there a better way to eradicate noxious weeds, R. J. EVANS *(Farm and Home Sci. [Utah Sta.], 5 (1944), No. 4, pp. 7, 13, illus. 2)*.—A whitetop control program, based on results of cropping treatment of infested areas, includes clean cultivation of the land the first year, check-planted corn cultivated every 2 weeks or as often as needed to keep down weeds the second year, and sugar beets the third year. Chemicals should be used in the fence lines and along ditch banks. Where immediate eradication is not practicable weeds may be kept under control and their vigor diminished greatly by a rotation such as barley, rotation pasture (or alfalfa 3 yr.), check planted and cross cultivated corn 1 yr., and sugar beets 1 yr. Weights of whitetop roots are shown for each treatment.

The chemical control of Klamath weed.—I, Application of ecological methods in determining the herbicidal and fertilizing properties of ammonium sulfamate and commercial borax, B. E. ALLGAIER. (Wash. State Col.). *(Ecology, 25 (1944), No. 4, pp. 424–432, illus. 4)*.—Range near Lapwai, Idaho, infested with Klamath weed or St. Johnswort (*Hypericum perforatum*) (E. S. R., 78, p. 780; 85, p. 618) was treated April 11, 1943 with ammonium sulfamate and borax, separately and in combination as dust and as sprays, and crested wheatgrass was broadcast on subplats under each treatment from April 25 to July 4. Weed counts and the staggered grass-planting dates revealed that ammonium sulfamate was a better herbicide than borax at the same rate, and also was more active as a subsequent fertilizing agent. Absolute weed control was obtained after 2 weeks in the ammonium sulfamate spray plat and after 4 weeks in the dust plat, while 8 weeks were required for a maximum control of 83 percent in the borax spray plat and 14 weeks for an 84 percent maximum in the dust plat. Grass sown on the ammonium sulfamate spray plat showed an acceleration in growth about 10 times that in the borax spray plat. The increase in growth under dust treatment was about 25 percent over the borax dust plat.

HORTICULTURE

Some plant and insect problems of Kentucky nurserymen during the year ended June 30, 1944, W. A. Price and H. G. Tilson *(Kentucky Sta. Regulat. Ser. Bul. 41 (1944), pp. 20).*—Information is presented on various insect and fungus pests, requirements of the Kentucky nursery inspection law, personnel in charge of inspection in the various States, lists of Kentucky nurserymen whose plantings were inspected in 1943–44, and lists of nursery dealers and nonresident nurserymen.

Analyses of materials sold as insecticides and fungicides during 1943, C. S. Cathcart and R. L. Willis *(New Jersey Stas. Insp. Ser. 12 (1943), pp. 19).*——Herein are presented in the usual manner (E. S. R., 89, p. 214) the results of analyses of materials collected during the 1943 inspection.

Sphagnum moss for seed germination, V. T. Stoutemyer, A. W. Close, and C. Hope *(U. S. Dept. Agr. Leaflet 243 (1944), pp. 6, illus. 7).*—Shredded sphagnum moss was found an ideal medium for seed germination in tests conducted with many different species of plants. The use of sphagnum removed the necessity of applying chemical protectants to the seeds or seeding medium and prevented harm from overwatering. If mineral nutrient solutions are used many plants make excellent growth beyond the seedling stage. Details of preparing the sphagnum, use of nutrient solutions, and handling the young seedlings are presented.

The pollination and spatial isolation of vegetable seed crops, G. Haskell *(North West. Nat., 19 (1944), No. 1–2, pp. 34–44).*—Data are presented for various members of the Cruciferae, Leguminosae, Umbelliferae, Cucurbitaceae, Compositae, Solanaceae, Chenopodiaceae, Liliaceae, and Gramineae.

Storage and drying of vegetables (*Alabama Sta. Rpt. 1941, pp. 21–22*).—Experimental results indicated that galvanized iron roofs exposed to full sunlight are useful in drying vegetables. On summer days the temperature on such roofs reaches about 110° F. at 8 a. m. and rises to 125°–137°, where it remains for several hours. Even on relatively cool autumn and winter days, the temperatures may rise above 100°. Among crops dried on roofs were shelled cowpeas, lima beans, soybeans, rape, mustard and turnip greens, and sliced roots of carrot, rutabagas and turnips. Other crops handled more or less successfully included sweetpotatoes, potatoes, and pimiento peppers.

Effects of 2,4-dichlorophenoxyacetic acid on the ripening of detached fruit, J. W. Mitchell and P. C. Marth. (U. S. D. A.). *(Bot. Gaz., 106 (1944), No. 2, pp. 199–207, illus. 1).*—Observations on the effects of 2,4-dichlorophenoxyacetic acid on the subsequent ripening of detached fruits and vegetables indicated that the chemical when applied either in aqueous solution with some wax or by the aerosol method hastens the ripening of bananas, apples, and pears, but on the basis of color changes had little effect on the ripening of the tomato, pepper, and persimmon, fruits which are generally without an appreciable starch reserve. Starch hydrolysis proceeded at a more rapid rate during the ripening of treated bananas, as shown by both iodine and taste tests.

Suggestions on irrigating commercial truck crops, L. D. Doneen and J. H. MacGillivray *(California Sta., [1943], pp. 5, illus. 7).*—This leaflet discusses the function and movement of soil moisture, the water-holding characteristics of soils, effect of soil structure on water penetration and depth of rooting, indications of a lack of soil moisture, determination of need of irrigation, factors affecting the frequency of irrigation, irrigation of the seedbed, depth of rooting of various truck crops, their irrigation needs, etc.

The characteristics of crosses between botanical varieties of cabbage, Brassica oleraceae, A. F. Yeager *(New Hampshire Sta. Sci. Contrib. 90 [1943], pp. 199–200).*—This study was noted earlier (E. S. R., 90, p. 623).

Effect of daylength on growth and reproduction of the cucumber, L. L. DANIELSON *(Plant Physiol., 19 (1944), No. 4, pp. 638–648, illus. 3)*.—Quantitative and qualitative determinations were made at intervals throughout the growing period on vines of gherkins growing in contrasting daily photoperiods of 8, 12, and 16 hr. and from which all lateral branches and flowers were removed as formed. Under the conditions stem elongation was retarded by 16-hr. photoperiods. Maximal stem elongation occurred in 8-hr. day length plants. Contrasted vegetative responses to day length became especially evident with onset of flowering, suggesting that the photoperiodic reaction of the stem is in some manner physiologically related to, if not dependent upon, the onset of flowering. Maximum staminate flower production on the basis of total number produced occurred in the 8-hr. day. Quantitative measurements of stem, leaf, and root growth as well as chemical composition showed that vegetative responses peculiar to each day length occurred.

Derris grows in America, R. H. MOORE *(U. S. Dept. Agr., Agr. in Americas 5 (1945), No. 1, pp. 10–12, 16, 18, illus. 4)*.—Among items discussed are the beginnings of derris culture in Puerto Rico, propagation, preparation of plants for shipment and planting, varieties, climatic requirements, culture, potential possibilities in the Western Hemisphere, etc.

Safflower, a possible economical oil-seed crop for Utah, D. W. PITTMAN *(Farm and Home Sci. [Utah Sta.], 5 (1944), No. 4, p. 15)*.—Safflower, long grown as an oil-seed crop in the arid desert regions of the Near East was tested and found capable of producing satisfactory crops of seed with a small amount of irrigation water. The potential uses of the crop are discussed.

Station conducts tests on growing sage for seasoning under irrigated methods, A. M. BINKLEY *(Colo. Farm Bul. [Colorado Sta.], 6 (1944), No. 5, pp. 3–5, illus. 2)*.—Herein are presented the results of tests in producing sage, a product which in peacetime is largely imported. Computed yields per acre were 131 lb. the year of setting and 1,373.0 and 2,442.9 lb. the succeeding 2 yr. Under present high prices some profit could be realized, but high cost of harvesting might well prohibit production under ordinary circumstances.

Pruning and training tomatoes in the South, M. T. DEONIER, G. P. HOFFMAN, C. E. STEINBAUER, and L. R. FARISH. (Coop. Miss. Expt. Sta.). *(U. S. Dept. Agr. Cir. 712 (1944), pp. 16, illus. 2)*.—The results of a series of experiments, carried on at several locations in Mississippi, indicated that under the conditions prevailing pruning and training were good practices when tomatoes are grown for shipment, especially for early markets, and when labor and materials are available. Of various methods tested, pruning and training to two stems gave the best results. Topping did not prove to be a worth-while practice. The fruit obtained from an acre of pruned and staked plants, spaced 2 by 4 ft., had a greater net value than that from an acre of unpruned plants set 4 by 4 ft. The average size of all the marketable tomatoes was larger on the pruned and staked plants, while the size of the early ripe fruits was apparently unaffected. The pruned and staked plants yielded slightly lower percentages of No. 3 and cull fruits, and slightly larger percentages of cat-faced fruits and fruits affected with blossom-end rot.

Influence of phosphorus supply and the form of available nitrogen on the nitrogen metabolism of the tomato plant, W. S. BREON and W. S GILLAM. (Ind. Expt. Sta.). *(Plant Physiol., 19 (1944), No. 4, pp. 649–659)*.—Tomatoes growing in a medium supplying nitrate as a source of nitrogen and moderately but definitely showing symptoms of phosphorus deficiency revealed an accumulation of nitrates in all parts of the plant. This condition is shown to be due to accumulation following more rapid absorption rather than to nonutilization. Plants receiving N in the form of urea, grew rapidly and vigorously as long as the pH of the culture solution was maintained at 6.8–7.0. At pH 4.8–5.0 growth was greatly

ENTOMOLOGY.

Insects of the clover field, G. C. DAVIS (*Michigan Sta. Bul. 116, pp. 41–64, figs. 11, pl. 1*).

Synopsis.—This bulletin consists of 2 parts, the first dealing with insects destructive to clover, comprising 4 species attacking respectively the root, leaf, seed, and hay; and the second giving brief notes on 8 species that are designated as common but not destructive.

Insects destructive to clover (pp. 41–58).—Illustrated notes on the appearance, life history, ravages, and treatment of the clover-root borer (*Hylastes obscurus*), clover-leaf weevil (*Phytonomus punctatus*), clover-seed midge (*Cecidomyia leguminicola*), and clover-hay worm (*Pyralis costalis*). The clover-root borer made its appearance in the State in 1889 and rapidly spread over the middle and southern portions, extending west to Lake Michigan. The greater destruction has been in the southern part, its progress being slower toward the north owing to the sandy forest regions. A map is given showing its distribution in the State. Investigations show that the imagoes first appear early in May, and the latter part of the month begin depositing their eggs in the galleries bored in the clover roots where they have hibernated. The larvæ begin to pupate about July, issuing as adults in the fall and passing the winter in that state. Red clover and mammoth clover suffer most severely, although alsike is also attacked. White clover seems to be exempt. The plants are rarely attacked until they are a year old. Experiments with nitrate of soda, muriate of potash, and kainit, applying them at the rate of half a ton and a ton per acre, were made, but the beetles were apparently unaffected, while the plants were seriously injured and some of them killed. Plowing under in the spring of the second year, or plowing in the summer and thus exposing the roots and young larvæ to the sun, are suggested as the only remedies at present known.

The clover-leaf weevil is found in all parts of the State except the northern, and has done considerable damage. This season the pest was destroyed in great numbers by a fungus disease (*Empusa sphærosperma*). This rapidly killed the larvæ, which before dying crawled up blades of grass and coiled themselves around the tips. In one instance, cattle feeding upon such grass were rendered sick, though no serious result ensued. A report on this fungus attack, by C. F. Wheeler, is included.

The clover-seed midge is considered the most dangerous enemy of the clover crop in the State, the flies depositing their eggs over the clover head before the florets open, and the maggots crawling into the flower tubes and making their way into the forming seed. The eggs for the first brood are laid in May, and for the second in July. Mammoth and common red clover are most attacked, alsike not being molested. Pasturing clover fields through the spring and early summer is recommended, or early cutting of the crop before the larvæ of the first brood have matured and dropped from the seeds to the ground to pupate.

The clover-hay worm is found only in dry clover hay, the eggs being deposited in June and the larvæ feeding throughout the rest of the year, and changing into moths the following spring. Clean mowing is advised and never storing clover hay 2 seasons in the same mow. Where hay is attacked, bisulphid of carbon may be applied, 3 or 4 lbs. to each ton, and the hay covered with heavy blankets for a few days.

Insects that are common but not destructive (pp. 58–64).—This part of the bulletin comprises illustrated descriptive, life history, and remedial notes on the following insects: Clover-root mealy bug (*Dactylopius trifolii*), clover-stem borer (*Languria mozardi*), common yellow butterfly (*Colias philodice*), clover drasteria (*Drasteria erechtea*), clover-head caterpillar (*Grapholitha interstinctana*), clover-head thrip (*Phlœothrips niger*), and the white-winged fly (*Bibio albipennis*).

The scale insect of mulberry trees, C. SASAKI (*College of Agr., Tokyo, Japan, Bul., vol. 2, No. 3, pp. 107–124, pls. 2*).—Illustrated descriptive and life-history notes on a scale insect of importance to the silk industry in the East, and which is technically described as a new species (*Diaspis patelliformis*).

The male is orange red, with yellow appendages, and 0.8 mm. long by 0.25 mm. broad. The wing expanse is 2 mm. The female is oval, light yellow, and possesses 9 segments, the third to the ninth being margined with a number of minute fine spines, simple or branched. There are two broods, the adults appearing in June and October, and the males dying soon afterwards, while the females of the second brood live through the winter on the mulberry bark. The larvæ in the first two stages of growth are oval, flat, and yellow, with 2 black eyes. At first they are very active, but after the second molt they become fixed to the bark and change into pupæ.

The species is found over nearly all of Japan, where it attacks chiefly the mulberry, but also some other trees, the branches frequently being completely covered with scales and the trees greatly injured. A crude method of treatment is to scrape off the scales from the bark, but spraying with limewater, kerosene emulsion, or a mixture of water, fish oil, and bicarbonate of soda, is recommended. A Chalcid and a Coccinellid prey upon the scale.

Some insects injurious to shade trees, J. B. SMITH (*New Jersey Stas. Bul. 103, pp. 15, figs. 4*).—Descriptive life history and remedial notes on the elm-leaf beetle (*Galeruca xanthomelæna*), wood leopard moth or imported elm borer (*Zeuzera pyrina*), and the white-marked tussock moth (*Orgyia leucostigma*). Spraying with London purple, Paris green or arsenate of lead is recommended for the elm-leaf beetle, an application to be made when the beetles are first noticed, a second when the larvæ begin to hatch, and a third 10 days later. The only remedy available against the wood leopard moth appears to be cutting down and burning all infested trees and branches, or pouring a few drops of bisulphid in the burrows and closing the opening with putty. It is recommended that the egg masses of the tussock moth be removed from the trees during the winter and burned, and that the caterpillars be sprayed in June with some one of the arsenites.

General remarks on protecting shade trees from insect attacks are given, and a list of 21 shade trees, in the order of least susceptibility to insect injuries.

Insect Life (*U. S. Dept. Agr., Division of Entomology, Insect Life, vol. VII, No. 2, pp. 55–215, fig. 1*).—This number is devoted to the proceedings and papers of the sixth annual meeting of the Association of Economic Entomologists, which met at Brooklyn, New York, August 14 and 15, 1894.

Brief account of the rise and present condition of economic entomology, L. O. Howard (pp. 55–107).—This paper consists of a historical sketch of economic entomology from the Middle Ages to the present time, giving in detail the growth and extent of this science in the United States, Canada, Great Britain, Germany, Austria-Hungary, Italy, France, Spain, the Netherlands, Norway, Sweden, Russia, Finland, South America, India, South Africa, Australia, the West Indies, New Zealand, and Hawaii. The scope and value of the work in the different countries is treated at length and the various investigators mentioned. The entomological work of the experiment stations is reviewed and a bibliographical list of their publications given.

Bisulphid of carbon as an insecticide, J. B. Smith (pp. 108–110).—An account of experiments with this chemical against melon lice, a dram of the liquid being placed in a saucer or small tumbler by each hill and the whole covered with a large wooden bowl. This was left undisturbed for an hour, when upon examination all the aphides were found to be killed. In the ensuing discussion the method was spoken of by several members favorably and modifications suggested.

Report of committee on coöperation among station entomologists, J. B. Smith (pp. 112–114).—Recommendations of lines of work in which entomologists may assist one another, notably in the study of life histories and geographical distribution, and the testing of insecticides.

Spraying without a pump, J. M. Aldrich (pp. 114, 115).—A preliminary note on an apparatus for mixing kerosene with water at the instant of passing through the nozzle, thereby doing away with the necessity of making kerosene emulsion.

Notes on insecticides, C. L. Marlatt (pp. 115–126).—General remarks on the scientific use of insecticides and notes on experiments with applications of standard insecticides, new insecticides, and modifications of old ones. The new peach scale (*Diaspis linatus*) and the euonymus scale (*Chionaspis euonymi*) were the species against which most of the experiments were directed, and kerosene emulsion proved most beneficial. Arsenate of lead was satisfactorily tested against the elm-leaf beetle, and Bordeaux mixture was combined with kerosene emulsion with good results.

Some observations on new and old insecticides and their combination with fungicides, B. T. Galloway (pp. 126–131).—General accounts of experiments in this line, notably with Bordeaux mixture combined with various insecticides, such as kerosene emulsion, Paris green, and resin wash, with formulas for the preparation of the various mixtures.

Spraying with arsenites vs. bees, F. M. Webster (pp. 132–134).—In order to determine definitely the injurious effect on bees, produced by spraying fruit trees when in bloom, two blossoming apple trees were sprayed with Paris green and bees caught visiting the flowers were analyzed. Traces of arsenic were found in the abdomens and honey sacs, though the exteriors of the bodies gave none of the poison. Bees and larvæ showing traces of arsenic were also found dead in and about adjacent hives, and in consequence it is urged that fruit trees be not sprayed before the falling of the bloom.

Economic entomological work in the parks of New York City, E. B. Southwick (pp. 135–138).—General remarks on the treatment of injurious insects in the New York City parks, with notes on several species, especially *Orgyia leucostigma*, *Zeuzera pyrina*, sap fly, and the elm-leaf beetle. Streams of water were sprayed upon plant lice by means of hose, with good results.

The wood-leopard moth in the parks of New York City, E. B. Southwick (pp. 138–140).—Notes on the life history of *Zeuzera pyrina* and the injuries caused to trees by it.

Work in economic entomology at the University of Kansas for the season of 1894, F. H. Snow (pp. 140–144).—Notes on satisfactory treatment of the chinch bug with *Sporotrichum globuliferum*, and upon *Agrotis introferens*, which cutworm was destructive to alfalfa and wheat.

Notes on some discoveries and observations of the year in West Virginia, A. D. Hopkins (pp. 145–151).—Life histories and notes on various injurious insects, especially the Columbian bark beetle (*Corthylus columbianus*), the potato-scab gnat (*Epidapus scabies*), and the chestnut timber worm (*Lymexylon sericeum*).

The eastern occurrence of the San José scale, L. O. Howard (pp. 153–163).—A review of the recent attacks of the San José scale in the eastern United States, with mention of the infested localities and a detailed account of the remedial treatment. The pest was spread from New Jersey nurseries that had distributed infested trees procured from California. A scymnid beetle (*Pentilia misella*) has been found to feed upon the scale.

The San José scale in New Jersey, J. B. Smith (pp. 163–167).—Notes on the occurrence of the pest in the State, with the treatment applied. Pears were chiefly attacked.

Mealy bugs and their allies, G. C. Davis (pp. 168–175).—Descriptive and life-history notes on *Dactylopius destructor*, *D. longifilis*, *D. trifolii*, and *Aleyrodes vaporarium*, with accounts of experiments.

The pear-tree psylla in Maryland, C. L Marlatt (pp. 175–185).—Notes on a sudden and overwhelming invasion of *Psylla pyricola* in two large pear orchards of southern Maryland, where the pest was introduced from a New York nursery. Twenty thousand trees were affected, and experiments were made with different emulsions against the pest. Kerosene emulsion applied when the eggs are hatching in the spring and winter spraying with a strong solution of the same are recommended. The lace-wing fly (*Chrysopa oculata*) and a ladybird, *Adalia bipunctata*, were effective destroyers of the psylla.

Notes of the year in New Jersey, J. B. Smith (pp. 185–197).—More or less detailed notes on injurious insects, especially the San José scale, pear psylla, pear midge, pear borer (*Agrilus acutipennis*), seventeen-year locust, and melon louse.

Special economic insects of the season, G. C. Davis (pp. 198–201).—Notes on *Diplotaxis harperi* attacking strawberries, a raspberry maggot (*Adimonia cavicollis*) on cherry foliage, *Notoxus anchora* eating cherries, and *Mononychus vulpeculus* destroying iris flowers.

Additional notes on the strawberry weevil, its habits and remedies, F. H. Chittenden (p. 201).—This paper was published in Insect Life, vol. VII, No. 1, pp. 14–23 (E. S. R., 6, p. 562).

Notes on the insects of north Idaho, J. M. Aldrich (pp. 201, 202).—General notes on several common fruit pests imported from the East.

Insects of the year, F. M. Webster (pp. 202–207).—Notes on various insect attacks, particularly those of the clover-leaf weevil, and a thrips, probably *Limothrips tritici*, which caused serious injury to onions.

Notes from New Mexico, T. D. A. Cockerell (pp. 207–211).—General remarks on insects in the Mesilla Valley and about Santa Fe.

Some experiences with mosquitoes, H. E. Weed (pp. 212, 213).—Notes on destroying mosquito larvæ by placing kerosene on the surface of the water where they bred.

A list of the American and foreign members of the association is appended.

Bordeaux mixture as a deterrent against flea beetles, L. R. JONES (*Agl. Sci., 8 (1894), No. 6–9, pp. 364–367, pls. 2*).—In consequence of the attacks of the cucumber flea beetle on potato plants in Vermont being scarcely at all checked by applications of Paris green, experiments were made with different strengths of Bordeaux mixture, ammoniacal copper carbonate, and modified eau celeste to ascertain their value as insecticides. The results were most satisfactory and far superior to those obtained by dusting the infested plants with a mixture of Paris green and land plaster. It is recommended that 2 applications of a strong solution of Bordeaux mixture be made, the first early in June, and another in July, which will in most cases be sufficient. Soap mixed with the solution was found to add slightly to its insecticidal value.

Farm practice and fertilizers as insecticides, J. B. SMITH (*Ontario Ent. Soc. Rpt. 1893, pp. 68-70*).—This paper treats of combating injurious insects by means of cultural methods, chief among which are suggested manuring with chemical fertilizers. Nitrate of soda and kainit are considered especially valuable, and the peach aphis, corn webworm, cabbage maggot, and wireworm are stated as insects against which these chemicals have been used effectively. Intelligent rotation of crops is also suggested.

Experiments with Botrytis tenella for destroying white grubs (*Deut. landw. Presse, 21 (1894), No. 88, pp. 828, 829*).—Four cages were made and the bottoms filled with earth, in which lettuce was planted, and after the plants were growing vigorously 25 white grubs were introduced into each cage. The grubs were buried at different depths in the earth, and 2 of the cages were kept very moist, while the other 2 were allowed to become quite dry. Two grubs were then infected with *Botrytis*, by being shaken up in a test tube with water and spores of the fungus, and placed one in a moist and the other in a dry cage. Two months afterwards the cages were examined, and though the experiment was interfered with by a severe mortality of the grubs, occurring in the check cages as well as in those infected, yet, since only 2 grubs remained alive in the infected damp cage as against several in the others, the destructive power of *Botrytis* under moist conditions is believed in. The fungus did not seem to act in the dry cage infected.

The spermatogenesis of the silkworm, K. TOYAMA (*College of Agr., Tokyo, Japan, Bul., vol. 2, No. 3, pp. 125-157, pls. 2*).—Technical embryological, anatomical, and physiological notes of investigations of this subject, with extensive figures.

The dragon fly, T. J. MACLAUGHLIN (*Ontario Ent. Soc. Rpt. 1893, pp. 55-60, figs. 6*).—Semipopular descriptive and systematic notes on some of the common dragon flies, their habits and effectiveness in destroying mosquito larvæ being particularly dwelt upon.

Mosquitoes, J. A. MOFFAT (*Ontario Ent. Soc. Rpt. 1893, pp. 43-48*).—General and popular notes on the geographical distribution and life history of *Culex pipiens*, with a discussion of the anatomy of the mouth parts and the physiological action of the bite. Burning pyrethrum powder in the house is recommended, as also growing castor beans and treating stagnant pools with kerosene.

Effects produced by ticks upon their hosts (*Agl. Jour. Leeward Islands, 1894, Oct., pp. 36-44*).

The cheese or meat skipper, M. E. MURTFELDT (*Ontario Ent. Soc. Rpt. 1893, pp. 98-101*).—Notes on the history, ravages, and life history of *Piophila casei*, the use of screens being advised as a preventive.

A new scale insect found on plum, T. D. A. COCKERELL (*Canadian Ent., 27 (1895), No. 1, pp. 16-19*).—*Aspidiotus howardi* is described as a new species from Colorado.

The bud moth, M. V. SLINGERLAND (*New York Cornell Sta. Rpt. 1893, pp. 27-52, figs. 8*).—A reprint of Bulletin 50 of the station (E. S. R., 4, p. 930).

The four-lined leaf bug, M. V. SLINGERLAND (*New York Cornell Sta. Rpt. 1893, pp. 217–248, figs. 13*).—A reprint of Bulletin 58 of the station (E. S. R., 5, p. 406).

Grasshoppers, J. FLETCHER (*Ontario Fruit Growers' Assn. Rpt. 1893, pp. 29–32*).—General and popular notes on the invasions of these insects, life history and treatment being given. A mixture of bran, arsenic, and sugar is recommended.

Destructive Scolytids and their imported enemy, A. D. HOPKINS (*Ontario Ent. Soc. Rpt. 1893, pp. 71–75*).—General remarks on the habits of various Scolytid bark beetles, especially *Dendroctonus frontalis* and *D. terebrans*, with notes on the introduction of *Clerus formicarius* from Germany to combat them. About 3,000 specimens of the latter beetle have been imported and placed in different sections of the pine forests in West Virginia, with already beneficial results.

Keys to the genera of Pediculidæ and Mallophagidæ, H. OSBORN (*Amer. Monthly Micr. Jour., 15 (1894), n. ser., No. 11, pp. 344–346*).—Technical analytical synopses of these lice.

Preliminary studies in the Siphonoptera, C. F. BAKER (*Canadian Ent., 27 (1895), No. 1, pp. 19–22*).—The first part of a technical paper.

Insect foes of American cereal grains, with measures for their prevention or destruction, F. M. WEBSTER (*Ontario Ent. Soc. Rpt. 1893, pp. 88–93*).—Notes on some of the more important insects attacking corn, wheat, and oats, the Hessian fly, chinch bug, Isosomas, apple-leaf louse, wireworms, white grubs, and cutworms being especially treated of.

Parasitic and predaceous insects in applied entomology, C. V. RILEY (*Ontario Ent. Soc. Rpt. 1893, pp. 76–84*).—General discussion of the value to man of the parasitic and predaceous insect enemies of such species as injure vegetation, with special remarks on some of the more important injurious insects and their enemies. Insects preying upon scale insects are especially mentioned and the Capri fig insect (*Blastophaga psenes*) is stated as almost invaluable in the fertilization of fig blossoms.

Injurious insects, W. H. HARRINGTON (*Ontario Ent. Soc. Rpt. 1893, pp. 17–31*).—Descriptive, life history, and remedial notes on the larch sawfly, rose sawflies, pear-tree slug, Cornel sawfly, fall cankerworm, and a few other insects of less injuriousness. Parasitism in insects is briefly treated of, and a careful study of entomological publications urged.

Injurious insects of the year, J. FLETCHER (*Ontario Ent. Soc. Rpt. 1893, pp. 8–13, figs. 8*).—This paper treats of some of the most important insect attacks of the season, particularly a maple gall moth, a squash carrion beetle, cutworms, turnip flea, horn fly, and locusts.

Insects injurious to plants, L. WOOLVERTON (*Ontario Fruit Growers' Assn. Rpt. 1893, pp. 101–106*).—A more or less popular paper on the life history and treatment of the codling moth, curculio, oyster-shell bark louse, pear-tree psylla, raspberry gallfly, and the parasites of the latter.

Nurseries as factors in the distribution of insect pests, J. B. SMITH (*Agl. Sci., 8 (1894), No. 6–9, pp. 361–363*).—A short discussion of the subject, citing the San José scale as an example of an injurious insect spread by nursery stock, and urging that the utmost care be exercised both by nurserymen and by orchardists to avoid the introduction of insects and plant diseases that have proved injurious elsewhere.

Report of entomologist, P. H. ROLFS (*Florida Sta. Bul. 24, p. 19*).—Brief mention of the entomological work during the year, specimen cases and rearing cages being added to the station outfit.

Arsenical spraying of fruit trees while in blossom, J. A. LINTNER (*Ontario Ent. Soc. Rpt. 1893, pp. 102–104*).—A discussion of the experiments in regard to the poisoning of bees from the spraying of fruit trees with arsenites, and urging more careful and extended investigations. The effect of the poisoning on the blossoms, fruit development, and leaves is remarked upon, and some of the insects checked by spraying are mentioned.

Methods of attacking parasites of domestic animals, H. OSBORN (*Ontario Ent. Soc. Rpt. 1893, pp. 96, 97*).—General notes on the subject, especially mentioning the treatment of bots by washes and dipping, and of lice by fumigation with sulphur or tobacco.

Fumigation with bisulphid of carbon for the complete and rapid destruction of insects which attack herbarium specimens, furs, woolens, etc., H. DU BUYSSON (*Ontario Ent. Soc. Rpt. 1893, pp. 94, 95*).—Detailed directions for the use of this insecticide for the purposes mentioned.

Protection of asparagus from insect enemies, E. OSCHENDORFF (*Deut. landw. Presse, 21 (1894), No. 78, p. 793*).—Notes on preventive treatment of several insects, especially the asparagus beetle.

Remedies against the grass cutworm (*Ztschr. landw. Ver. Hessen, 1894, No. 23, pp. 185, 186*).—General notes on ravages by the caterpillars of *Charæas graminis*. Kerosene emulsion seems to be preferred as an insecticide.

The rose chafer or rose bug, how to deal with it, F. M. WEBSTER (*Ohio Hort. Soc. Rpt. 1893-'94, pp. 87-91*).—Life-history notes on *Macrodactylus subspinosus*, and the results of experiments in combating it. Plowing the sandy soil in which the insect breeds 3 in. deep in May and early June is recommended, and hand picking the adults.

A remedy for insects injuring sugar cane, F. A. F. C. WENT (*Sugar Cane, 26 (1894), No. 303, pp. 551, 552*).—Notes on experiments.

Circumstances favoring the extension of fungus diseases among insects, P. VUILLEMIN (*Rev. Mycol., 17 (1895), No. 1, pp. 21, 23*).

Defense of insects against parasites, L. CUÉNOT (*Compt. Rend., 19 (1894), No. 19, pp. 806-808*).—Brief notes on some of the means by which insects escape parasitism, crickets being especially mentioned.

The economic value of parasites and predaceous insects, J. B. SMITH (*Ontario Ent. Soc. Rpt. 1893, pp. 84-87*).—General discussion of the subject, with particular reference to the insect enemies of scale insects, potato beetles, cranberry insects, codling moth, and melon louse.

Investigations of bacteria infesting caterpillars, K. ECKSTEIN (*Ztschr. Forst.- und Jagdw., 26 (1894), No. 1, p. 3; No. 4, p. 228; No. 5, p. 285*).—Notes on some experiments with insect bacterial diseases, with varying success.

FOODS—ANIMAL PRODUCTION.

Mannane as an article of human food, C. TSUJI (*College Agr., Tokyo, Japan, Bul., vol. 2, No. 2, pp. 103-105*).—There are sold in Japan as food gelatinous colorless tablets made from the tuberous rootstocks of *Amorphophallus rivieri durien*, a plant belonging to the *Aroideæ* and largely cultivated in Japan. These tablets appear to consist of starch paste, but do not give any reaction with iodin, and the author's investigations indicate that they are composed of mannane, a polyanhydrid of mannose. The dried ground rootstock yielded 55.86 per cent of mannose. All attempts to convert the mannose of this powder into a sugar by diastase were unsuccessful.

Rations fed to milch cows in Connecticut, C. D. WOODS and C. S. PHELPS (*Connecticut Storrs Sta. Bul. 13, pp. 16*).—In the Annual Report of the station for 1893 (E. S. R., 6, p. 458) the details were given of the study of the rations fed to 16 herds of cows in Connecticut. In the winter of 1893-'94 this study was continued on 6 herds. A representative of the station visited these farms and remained during the test, which in 4 cases lasted 12 days, weighing and testing the milk, weighing the foods and sampling them for analysis, and collecting statistics as to the breed, age, period of lactation, etc., of the cows. As soon as the analyses of the feeding stuffs could be made the rations were calculated and in 3 cases other rations were suggested. The feed was gradually changed to the suggested ration, and after 4 weeks from the close of the first test another 12 days' test was made. The summary of the results of these 2 tests at the 3 farms is given in the following tables, test No. 1 indicating the original ration and No. 2 the suggested ration in each case:

Summary of daily rations fed and daily milk and butter yield from three herds with a wide and a narrower ration.

Herd.	Average weight of cows.	No. of test.	Daily ration per head.					Average daily—		Total cost of food to produce—	
			Digestible protein.	Fuel value of digestible nutrients.	Nutritive ratio.	Total cost.	Net cost.	Milk flow.	Yield of butter.[1]	100 lbs. milk.	1 lb. butter.
	Lbs.		*Lbs.*	*Calories*	*1:*	*Cts.*	*Cts.*	*Lbs.*	*Lbs.*		*Cts.*
A	825	1	2.15	32,750	7.3	26.6	14.3	18.1	1.07	$1.47	25
		2	2.39	29,460	5.7	21.7	9.8	18.9	1.00	1.15	19
B	750	1	1.49	25,800	8.5	18.6	9.5	18.1	.87	1.00	21
		2	2.01	24,760	5.7	18.3	9.0	17.9	.89	1.03	20
C	725	1	1.38	21,150	7.3	19.4	12.5	13.7	.65	1.41	30
		2	1.80	22,400	5.7	17.8	9.9	13.6	.69	1.30	26
Suggested rations	825	....	2.06	25,600	5.6						
	750	....	1.88	23,250		......	......	......	......	......	......
	725	....	1.81	22,500							

[1] Butter assumed to contain 85 per cent butter fat.

"At the time of the second test in each case the cows were 6 weeks further along in the period of lactation, and would in consequence have naturally reduced their milk flow and butter yield. . . .

"In the case of herd A, instead of a falling off in milk flow there was an average daily increase of seven tenths of a pound in the test while they were fed the narrow ration over what it had been with the wide ration 6 weeks earlier. There was practically no change in milk flow in the case of the two other herds. With all three herds there was a slight increase in butter yield with the narrow ration in the second test. The total size of the ration as measured by the fuel value averaged less in the second test than in the first. The protein was increased and the carbohydrates and fats were decreased in the second test.

"In these cases both milk flow and butter yield were so much affected by a change from a wide to a narrow ration that instead of a shrinkage in production, as would naturally follow from advancement in period of lactation, the animals more than held their own. . . .

"The cost of milk and butter production from the food alone was much less on the narrower ration, even when the cows were 6 weeks further advanced in lactation than earlier on the wide ration. So far as these tests may be taken as an indication, narrow rations may be fed more profitably than wide."

The rations of the 16 herds studied previously are arranged according to nutritive ratio and amount of protein in the ration. A comparison of these data with the yields of milk and butter develops the following facts:

"The animals having the narrower rations produced on the average one tenth of a pound more of butter per day than those having the wider, and those having the larger amounts of protein gave, on the average, two tenths of a pound more of butter per day than those having the smaller quantities of protein. Too much importance should not be attached to these results, as they may have been partly accidental, and due to causes other than feed. It is, nevertheless, a noteworthy fact that in the cases in which the cows were in about the same period of lactation, the yields of butter decreased as the protein decreased, and as the nutritive ratio increased. This would seem to indicate that it would be safe in general to feed as much or even more protein than called for by Wolff's standard ration if we would obtain the largest yields of butter from our milch cows."

Feeding experiments with fat-extracted fish meal for cows, KÜHN-CORNIETEN (*Molk. Ztg., 81 (1894), No. 44, p. 675*).—A practical trial with 6 cows. Ground fish, freed from fat, was gradually introduced into the ration as a substitute for brewers' grains and sunflower-seed cake. From 1¼ to 2¼ lbs. (German) per head was fed, and several analyses of the milk were made at the Königsberg station. The yield and composition were fairly well maintained on the fish meal. In regard to the quality of the milk and butter, Professor Klein, of the Königsberg station, reported that they did not differ especially from that produced on oil cakes. After keeping for a half year the butter, although it was somewhat rancid and tasted old, had no fishy or unusual taste. The fish meal had no ill effects upon the cows.

Comparative value of mixed grain and wheat bran or shorts for milch cows, F. FRIIS (*Kgl. Vet. Landt. Lab. Landökon. Forsög., Copenhagen, Bul. 29, 1894, pp. 76*).

Synopsis.—Feeding experiments conducted during 1893 and 1894 by the State experiment station at Copenhagen, Denmark, at 7 different estates with 447 cows in all. Mixed oats and barley were compared with wheat bran and with wheat shorts. No appreciable difference was found as to the effect of the feeds given on either yield or composition of the milk produced. The tendency was toward a slight superiority of the bran over the grain, and of shorts over the bran.

The report describes the sixth and seventh series of feeding experiments with milch cows conducted by the Danish State agricultural experiment station. The plan of the experiment was similar to that of the preceding series (E. S. R., 4, p. 601). The experiments were conducted during 1893 and 1894 at 7 different estates with 247 and 240 cows, respectively. All the cows received the same feed during the preliminary period and the after feeding (the post-experimental period). During the experiment proper the feed of one lot of cows remained as in the preliminary period, while that of the other two lots was changed in the manner indicated by the following example: At one of the estates (Bregentoed) all cows received during the preliminary feeding and during period 2 3 lbs.[1] of mixed grain (one third barley, two thirds oats), 3 lbs. of wheat bran, 2 lbs. of oil cakes (equal parts of rape, palm nut, and sunflower-seed cake), 20 lbs. of mangel-wurzels, 6 lbs. hay, and straw *ad libitum.* During period 1 the grain feed was changed for lot A to 6 lbs. mixed grain, and for lot C to 6 lbs. of wheat bran, in both cases in the place of 3 lbs. each of grain and bran.

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[1] Danish pounds; 1 lb. Danish=1.1 lb. avoirdupois.

At some estates there was a fourth lot (D) which received wheat shorts in the place of wheat bran, but otherwise the same as lot C. Analyses of products and of fodders fed were made as in previous experiments.

Effect on quality of milk.—The average percentages of fat for all cows included in the experiments of both years were as follows:

Average per cent of fat in milk.

Lot.	Experiments of 1893.			Experiments of 1894.			Average for both years.		
	Preliminary period.	Period 1.	Period 2.	Preliminary period.	Period 1.	Period 2.	Preliminary period.	Period 1.	Period 2.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per sent.*	*Per cent.*	*Per cent.*
A	3.13	3.09	3.27	3.04	2.99	3.25	3.09	3.04	3.26
B	3.13	3.16	3.30	3.06	3.06	3.28	3.10	3.11	3.29
C	3.12	3.14	3.28	3.09	3.10	3.30	3.10	3.12	3.29

There is no marked difference in the fat content of the milk produced by the different lots during either period of the experiment. There was a small decrease in the fat content of the milk produced by lot A during period 1, in 11 out of 14 series, over that of lot B. From period 1 to period 2 there was a similar increase in the per cent of fat in the milk produced by this lot. These differences are, however, in the author's opinion, too small to be of any practical importance.

The complete chemical analyses of the samples of milk from the different lots also failed to disclose any decided difference in the composition of the milk attributable to the different concentrated foods fed, and the author therefore concludes that "in the comparative feeding trials with milch cows now continued for 7 consecutive years at this station, in which 1,639 cows have been included (separated into 161 lots on 10 estates in different parts of our country), it has been found over and over again that the changes made in the food of the lots have had practically no influence on the chemical composition of the milk. In these experiments grain has been fed against roots, against oil cake, and against wheat bran or shorts; grain and oil cakes have been fed against roots, or roots have been fed as an additional food."

Effect on milk yield of cows.—At the beginning of the experiments the cows in lots A, B, and C had been in milk 93, 93, and 94 days, respectively, as an average for both years. The average age of the cows in lots A, B, and C was 7.7, 7.6, and 7.6 years, respectively. These two factors are of the greatest importance in determining the decrease in milk yield of a number of cows during a given period. The average daily yields of milk for each lot during the different periods were as shown below:

Average daily yield of milk per cow.

Lot.	Experiments of 1893.			Experiments of 1894.			Average for both years.		
	Preliminary period.	Period 1.	Period 2.	Preliminary period.	Period 1.	Period 2.	Preliminary period.	Period 1.	Period 2.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
A	24.7	21.3	19.0	25.8	22.4	20.6	25.3	21.9	19.8
B	24.6	21.6	19.5	25.8	22.5	21.2	25.2	22.1	20.3
C........	24.7	21.8	19.7	25.8	22.3	20.9	25.3	22.1	20.3

The results indicate a similar nutritive effect in the feeds compared with a slight increase in favor of the wheat-bran feeding. The differences found, however, are not on the average greater than what might have been found in feeding a similar number of cows the same feeding stuffs for several months.

The average live weights of the cows increased during the experiment; the increase was greater for lot B than for lot A, and greater for lot C than for lot B. The cows in lot B and C ate somewhat more straw than those in lot A, the difference being about 0.4 lb. per head daily.

Wheat shorts vs. wheat bran.—The experiments with these foods were conducted with 240 cows, 6 trials being made in all on 3 different estates each year. No appreciable difference was apparent in the effect of the foods either on the quality or the quantity of milk produced, or in change of live weight of the cows during the experiment. A small difference in favor of shorts as regards the yield of milk was found in 3 trials.—F. W. WOLL.

Record of a herd of cows at Weende, BACKHAUS (*Jour. Landw. 42, No. 3, pp. 243–281*).—This is the individual record for one year of a herd of 59 cows. Trial milkings were made weekly, and composite samples were taken for testing.

Of the 20 cows which gave over 4,000 kg. of milk during the year, 14 had a relatively short lactation period, calving during the year, while only 6 gave milk throughout the year. The results indicate that as far as the milk yield is concerned it is most advantageous to have the cows calve as often as possible. In the majority of cases the milk yield and the fat content were in inverse proportion. Usually the fat content increased as the milk yield decreased with advancing lactation; and out of the 20 cows giving over 4,000 kg. of milk only 6 gave milk with the average fat content for the herd—3.266 per cent. The percentage of solids-not-fat was usually much more uniform than that of fat. In the case of 3 cows which did not get with calf, there was no increase in the percentage of fat and solids-not-fat as they shrunk in milk, and 3 other cows tested for a short time and then sold because they did not get with calf showed a similar tendency. This suggests to the author the theory that the increase in the richness of milk with advancing lactation may follow as a result of being with calf rather than of the shrinkage in yield.

Fattening lambs, C. D. SMITH and F. B. MUMFORD (*Michigan Sta. Bul. 113, pp. 27*).—This experiment was made to compare different grain foods for lambs during winter. It included 125 grade Shropshire lambs, divided into 9 lots, which were fed in the barn from November 27 to March 12. The food was given to all *ad libitum*. It consisted of clover hay with different grain feeds, with or without roots. The rations, aside from the clover hay, are given in the following table, together with the amounts of protein and carbohydrates which the animals in each lot consumed per 1,000 lbs. live weight daily:

Character and composition of rations of lambs.

Lot.	Ration.	Nutrients fed daily per 1,000 lbs. live weight, Protein.	Nutrients fed daily per 1,000 lbs. live weight, Carbohydrates.	Nutritive ratio of food.
		Pounds.	*Pounds.*	
1	Whole corn	2.0	16.0	1:8.0
2	Whole corn and roots	2.1	16.7	1:8.0
3	4 parts corn to 1 part linseed meal, and roots	2.7	16.1	1:6.0
4	4 parts corn to 1 part linseed meal	2.8	15.7	1:5.6
5	Whole corn and wheat bran, equal parts	2.5	14.8	1:6.0
6	Whole corn and whole wheat[1]	2.1	15.5	1:7.5
7	5 parts whole wheat to 1 part linseed meal	2.7	15.0	1:5.5
8	Whole corn ("self-feed")	2.0	15.7	1:7.9
9	Whole corn and wheat bran, equal parts ("self feed")	2.6	16.1	1:6.2

[1] Proportion not stated.

The linseed meal used was new process. The roots consisted of a mixture of equal parts of ruta-bagas and sugar beets. A detailed record is given for each lot of the food eaten, gains, cost of food eaten, and the financial result. In the latter the lambs are reckoned at 3 cts. per pound at the beginning and at 3.9 cts. per pound at the close of the experiment, and no allowance is made for the value of manure or the cost of attendance. The relations of temperature to gain, of carbohydrates and protein to gain, and of temperature to the amount of dry matter required to produce a pound of gain are discussed and illustrated graphically.

A summary of the results is as follows:

Lot.	Ration.	Average weekly gain.	Dry matter fed per pound of gain.	Cost of food per pound of gain.	Average profit per lamb.
		Pounds.	*Pounds.*	*Cents.*	*Cents.*
1	Corn	2.18	7.02	4.6	51.0
2	Corn and roots	2.64	6.41	4.6	45.6
3	Corn, linseed meal, and roots	2.61	6.72	5.3	20.0
4	Corn and linseed meal	2.38	6.99	5.1	31.0
5	Corn and bran	1.78	9.13	5.3	17.0
6	Wheat and corn	1.97	7.64	5.4	31.0
7	Wheat and linseed meal	1.94	8.04	6.3	1.0
8	Corn ("self-feed")	1.65	8.57	5.7	30.0
9	Corn and bran ("self-feed")	1.58	10.03	6.8	2.0

"(1) Under the conditions existing in this experiment the lot receiving a good quality of clover hay with a grain ration of whole corn required less dry matter to produce a pound of gain, made greater gains, were in better flesh, and in general were fed at a greater profit than the lots fed corn and bran, corn and wheat, or wheat and oil meal.

"(2) Lots receiving roots in the ration required less dry matter to each pound of gain, made greater gains, and drank less water than the other lots fed the same ration without the roots.

"(3) This experiment would seem to indicate that, when the conditions are similar to those in this test, the feeding of wheat to fattening lambs is better practice than selling at the prices prevailing during this experiment.

"(4) This experiment indicates that lambs may be successfully fattened by means of a self-feed, but the gains made are produced by a greater consumption of dry matter for a pound of gain, and are consequently less profitable than gains resulting from feeding at regular intervals in the ordinary manner.

"(5) In this experiment the value of foods for fattening purposes seems to depend more upon the supply of available carbohydrates than upon the supply of protein.

"(6) Cold temperatures were favorable to increased gains and warm temperatures were very generally accompanied by decreased gains.

"(7) Less dry matter was required to produce a pound of gain in cold than in warm temperatures."

Grain feeding lambs for market, J. A. CRAIG (*Wisconsin Sta. Bul. 41, pp. 21*).—Three separate experiments are described in feeding grain to lambs before weaning, between weaning and fattening, and during the fattening period only. In the first two experiments there were 2 lots of lambs, one lot being fed grain from before weaning until the close of the fattening period, and the other lot receiving no grain until the fattening period. In the third trial there were 3 lots, the grain feeding commencing with one lot before weaning, with another after weaning, and with the third during the fattening period.

The grain fed before weaning was corn meal, wheat bran, and linseed meal; between weaning and fattening, corn and linseed meal, or whole oats; and during fattening, corn, oats, and linseed meal, or corn and linseed meal, or corn and oats. Between weaning and fattening the lambs were all pastured.

The feeding period before weaning was 10 to 12 weeks; between weaning and fattening, 14 to 19 weeks, and the fattening period, 12 to 14 weeks. At the end of each period the lambs were valued by a local butcher. In estimating the relative cost, the gain only is considered and no account taken of the pasturage. The first experiment has been already reported in the Annual Report of the station for 1892 (E. S. R., 5, p. 503). The results of the 3 experiments are tabulated in the bulletin, and are concisely stated in the following summary:

"(1) The feeding of grain before weaning produced an average of 61 cts. per head more profit at weaning time than that obtained from the lambs receiving no grain. The average value of each lamb in the lot receiving grain at $5.66 per 100 lbs. was $3.83 per head, and the average value of the grain they ate was 33 cts. per head, while the average value of the other lot not receiving grain at $4.91 per 100 lbs. was $2.89, leaving 61 cts. profit per head in favor of grain feeding. The average of the three trials shows that the grain-fed lambs before weaning required 4 lbs. of grain for each 1 lb. of gain that they made over the lambs that had no grain.

"(2) The feeding of grain after weaning to lambs that had not received any before weaning produced an average increase which slightly more than paid a good market price for the grain they ate up to the time they were to be sold in the fall. The average value of each lamb in the fall after having received grain from weaning time was $3.66 at $4 per 100 lbs., and they ate 54 cts. worth of grain per head, while the average value per head of those that had not received grain, at $3.81 per 100 lbs., was $2.96, a difference of 16 cts. in favor of the lambs fed grain since weaning. As the average of the three trials it required 6.7 lbs. of grain for the grain-fed lambs to make 1 lb. of gain more than those that had no grain.

"(3) The feeding of grain both before and after weaning produced an average of 34 cts. per head more profit if sold in the fall than that obtained from the lambs that were not fed grain. The average value in the fall of each lamb in the lots receiving grain before and after weaning, at $4.81 per 100 lbs., was $4.82, and the average cost of grain was $1.38, while at the same time those that had no grain, at $3.81 per 100 lbs., were worth an average of $3.10 per head; a difference in profit of 34 cts. per head to the credit of the lambs that received grain.

"(4) The results of the three trials show that there is no appreciable difference in the gain made during the winter fattening between the lambs that had grain previous to fattening and those that had not. The difference in the cost of gain was more marked, there being an average difference of 29 cts. per 100 lbs. in favor of those that had no grain previous to fattening. The average weekly gain per head of the lambs fed grain previously was 2.89 lbs. during the fattening, while that of the other lambs was 2.95. The average cost of 100 lbs. of gain was $4.93 in the instance of the grain-fed lambs, and $4.66 with those that had no grain before fattening started.

"(5) When the experiment was concluded and the lambs that had grain before fattening and those that had not were ready for market, the average profit from the former was 48½ cts. per head greater than from the latter. The average weight of the grain-fed lambs when sold was 140.2 lbs., and that of the others was 121.7 lbs. per head. The former brought 75 cts. per 100 lbs. more than those that had no grain before winter feeding.

"(6) The grain feeding had a marked influence on the earliness of the maturity of the lambs. In the first two trials the grain-fed lambs reached an average of 125 lbs. per head in weight 7 and 4 weeks, respectively, before the others. In these trials the average cost of this weight in the instance of the grain-fed lambs was $2.68 per head, exclusive of pasture, while in the instance of the other lambs it was $1.96 per head. This difference in cost was largely due to the heavy feeding of grain after weaning, and when this was guarded against in the third trial it was found that the average of 113.9 lbs. per head, which the lambs that had no grain reached on the conclusion of the experiment, was made 7 weeks sooner by the lambs fed grain continuously, and it was made at a slightly less cost.

"(7) There was no difference in the character of the meat in the carcasses of the lambs that had grain continuously and those that had not.

"(8) The per cent that the lambs dressed was about the same in all lots, and no marked difference was found in the weight of the different organs of the body.

"(9) The feeding of grain made all the fleeces of the lambs receiving it more compact and smoother than the others.

"(10) The grain-fed lambs sheared in the 3 trials an average of 2.2 lbs. more wool than the others.

"(11) The greater amount of wool shorn by the grain-fed lambs was to an extent due to the greater amount of yolk or oil it contained. The shrinkage in the first two trials was 5 per cent greater in the instance of the grain-fed lambs than with the others, and in the last trial it was 2 per cent greater.

"(12) The wool on the lambs that were fed grain continuously grew to a slightly greater length than it did in the fleeces of the others. In the first trial the average length of the shoulder fiber in the grain-fed lot was 5 in. as against 3.76 in the other; in the second trial, 4 in. as against 4.2 in.; and in the third it was 3.3 in. against 2.9 in. The second trial showed no appreciable difference in this particular."

Preliminary report of a feeding test with swine, E. R. LAKE (*Washington Sta. Bul. 11, pp. 31–36*).—A brief account of feeding 3 pigs for 55 days on wheat and barley chop alone or combined. The inference is drawn that barley chop alone is a more profitable feed than wheat alone at approximately the same price, and that barley and wheat mixed in the proportion of 1 to 2 is better than either alone.

Comparative investigations of rye spoiled by storing in elevators, and the bread baked from the same, THAL (*Pharm. Ztschr. Russland, 33, pp. 641–646; abs. in Chem. Centbl., 1894, II, No. 25, p. 1002*).

The use of salt as a cattle food, B. ROST (*Molk. Ztg., 8 (1894), No. 52, p. 803*).

Food stuffs for domestic animals in times of drought, N. BOCHICCHIO (*Staz. Sper. Agr. Ital., 27 (1894), No. 20, pp. 386–399*).

Analyses of fodder articles, C. A. GOESSMANN (*Massachusetts State Sta. Bul. 56, pp. 4–7*).—This includes tabulated analyses (food and in most cases fertilizing constituents) of 23 samples of feeding stuffs, including cotton-seed meal (decorticated and undecorticated), cotton-seed bran, gluten meals, and feeds of different kinds, oil cake, peanut cake, peanut husks, peanut feed, and meat meal.

Stock feeding in Illinois, G. E. MORROW (*Illinois Sta. Bul. 36, pp. 421–431*).—Replies to a circular letter were received from 108 feeders in different parts of the State in regard to feeding cattle, pigs, and sheep. These embody much practical information of interest and value, and are summarized in the bulletin. In addition the practical deductions from experiments on various phases of stock feeding, covering a number of years, are summarized.

Stock feeding, G. L. TELLER (*Arkansas Sta. Bul. 30, pp. 137–170*).—This is a popular bulletin on the subject of feeding, including information on the composition of feeding stuffs, the principles of feeding, feeding standards, calculation of rations, and tables showing the digestible nutrients in a number of feeding stuffs.

Tests of dairy cows at experiment stations, E. HITCHCOCK (*Cult. and Country Gent., 1894, Jan. 31, p. 92*).—A criticism of methods.

Cost of milk production, H. H. WING (*New York Cornell Sta. Rpt. 1893, pp. 69–95, pls. 2, figs. 4*).—A reprint from Bulletin 52 of the station (E. S. R., 4, p. 936).

Peanut oil as a food supplementary to skim milk in calf feeding, M. PETERSEN (*Fühling's landw. Ztg., 44 (1895), No. 1, pp. 13–17*).

VETERINARY SCIENCE AND PRACTICE.

Bovine tuberculosis, J. L. HILLS and F. A. RICH (*Vermont Sta. Bul. 42, pp. 70*).

Synopsis.—The subjects treated are the following: A detailed account of a tuberculin test of the station herd; the prevalence of tuberculosis in the State; a general discussion of the tubercle bacillus, of sources of infection, and of conditions favoring the development of tuberculosis; a brief description of the symptoms and lesions of the disease; a general discussion of the tuberculin test and of the objections sometimes urged against it; the interrelation of human and bovine tuberculosis; methods of sterilizing or pasteurizing milk; means of preventing the spread of tuberculosis, and the relation of the State toward this disease.

Thirty three animals in the station herd, most of them milch cows, were tested with tuberculin one or more times. In 24 instances there were reactions. *Post-mortem* examinations confirmed the test throughout. The distribution of the disease was as follows: Lungs, bronchial and postpharyngeal glands, 90 per cent; udder and supermammary glands, 73 per cent; and intestinal and mesenteric glands, 50 per cent.

Of 786 Vermont cattle tested with tuberculin by the station veterinarian, 138 were tuberculous. Omitting the station herd and one other large herd in which five sixths of the animals were diseased, there were 39 tuberculous animals out of a total of 662. The proportion of tuberculous cattle in the State, however, is regarded as less than these figures would seem to indicate, for the herds in which the tests were made were those in which the presence of the disease was suspected.

In ascertaining the normal temperature of the animals tested, it was found convenient in some cases to determine this several days after the injection of the tuberculin was made.

The authors advise caution in the interpretation of tuberculin tests made on a 2-year-old with her first calf, as the first gestation renders the system highly susceptible to any excitement.

> "It has been claimed that animals suffering from actinomycosis may react to tuberculin. From a practical standpoint, since lumpy jaw is contagious and communicated to man, this makes little difference, yet it is not impossible that there may have been tubercular lesions overlooked in these cases. One of us had 2 cases of this kind. One cow with lumpy jaw gave no reaction whatever to tuberculin; another, with both tuberculosis and lumpy jaw, gave the highest reaction (108.6°) yet obtained."

In over 1,000 cases injected there were found only 2 cases of nonreacting tuberculous cattle. Old cows responded less readily than other animals to the usual dose of tuberculin. In the author's experience no injurious effect has followed the use of tuberculin on healthy animals.

> "It is already claimed that other materials will cause the same febrile reaction. Taurin and kreatin (Merck's) have given good results in the hands of Dr. W. L. Zuill, of Philadelphia, and E. Centanni claims that 'it has been proved that identically the same action as that of tuberculin can be produced by the injection of the extracts or other products of various bacteria, even such as are known to have no pathogenic (disease-producing) properties.' . . .
>
> "The aggravation of the disease in tuberculous animals is not a valid argument in cases where such as react are promptly killed. No one who expects to keep his mild cases should permit its use, for it only makes a bad matter worse."

The bulletin contains data relative to the attitude toward tuberculosis of the boards having control of the live stock interests of Ontario, Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Ohio, Indiana, Illinois, Tennessee, Michigan, Minnesota, Kansas, Colorado, Oregon, and Missouri.

Hog cholera and swine plague, D. E. SALMON (*U. S. Dept. Agr. Farmers' Bul. 24, pp. 15*).—This bulletin, prepared in the Bureau of Animal Industry, treats of the symptoms, *post-mortem* appearance, causes, treatment, and sanitary measures for the prevention of hog cholera and swine plague. Experiments made during the past year indicate that the treatment of these diseases may be successful.

"The most efficacious formula which has been tried is the following:

	Pounds.
Wood charcoal	1
Sulphur	1
Sodium chlorid	2
Sodium bicarbonate	2
Sodium hyposulphite	2
Sodium sulphate	1
Antimony sulphid	1

"These ingredients should be completely pulverized and thoroughly mixed.

"The dose of this mixture is a large tablespoonful for each 200 lbs. weight of hogs to be treated, and it should be given only once a day. When hogs are affected with these diseases they should not be fed on corn alone, but they should have at least once a day soft feed, made by mixing bran and middlings, or middlings and corn meal, or ground oats and corn, or crushed wheat with hot water, and then stirring into this the proper quantity of the medicine. Hogs are fond of this mixture; it increases their appetite, and when they once taste of food with which it has been mixed they will eat it, though nothing else would tempt them.

"Animals that are very sick and that will not come to the feed should be drenched with the medicine shaken up with water. Great care should be exercised in drenching hogs or they will be suffocated. Do not turn the hog on its back to drench it, but pull the cheek away from the teeth so as to form a pouch, into which the medicine may be slowly poured. It will flow from the cheek into the mouth, and when the hog finds out what it is it will stop squealing and swallow."

An inquiry into the alleged relation existing between the Burrill disease of corn and the so-called cornstalk disease of cattle, V. A. MOORE (*Agl. Sci., 8 (1894), No. 6–9, pp. 368–385*).—The author's conclusions are as follows:

"(1) There is no species of bacteria or other microörganism which can be demonstrated by microscopic examination, or by ordinary bacteriological methods, constantly present in the organs or blood of cattle dying late in the fall or early winter of the so-called cornstalk disease.

"(2) The disease of corn described by Professor Burrill in the mature plant is widely distributed. Its lesions are usually associated with a single species of bacteria (*Bacillus cloacæ*).

"(3) Full-grown cornstalks affected with the corn blight have no ill effect upon cattle feeding exclusively upon them, neither do they produce a bacterial disease in rabbits.

"(4) The dwarfed cornstalks are harmless to rabbits. This form of the Burrill disease is presumably due to causes other than bacteria.

"(5) Pure cultures of the bacillus found in the lesions of the diseased corn, and supposed to be their cause, have no pathogenic effect on experimental animals, excepting when excessively large quantities are injected into the circulation.

"(6) The bacillus first described by Professor Burrill, and isolated by him from the lesions in the diseased corn, belongs to the *Bacillus cloacæ* group of bacteria, which is widely distributed in nature. This group of organisms is not known to be possessed of any marked economic importance.

"(7) There is no clinical or experimental evidence sufficient to show that the Burrill disease of corn is responsible for any disease in animals. There are, on the contrary, many facts to support the assumption that there is no causal relation whatover existing between this malady and the so-called cornstalk disease of cattle."

The horse's teeth, E. P. NILES (*Virginia Sta. Bul. 36, pp. 7*).—This consists of a statement concerning the age at which the different temporary teeth are replaced and a general discussion of the symptoms attributable to defects of the teeth in colts and mature horses. None of the operations intended to remedy defects of the teeth are described.

Dehorning, I. P. ROBERTS (*New York Cornell Sta. Rpt. 1893, pp. 129–143, figs. 3*).—A reprint of Bulletin 54 of the station (E. S. R, 5, p. 204).

Losses following vaccination against anthrax, J. McFADYEAN (*Jour. Roy. Agr. Soc. England, 3d ser., 5 (1894), No. 20, pp. 800–807*).

Researches on the production of the charbon bacillus without spores, H. SURMONT and E. ARNOULD (*Ann. Inst. Pasteur, 8 (1894), No. 12, pp. 817–832*).

Investigations of bovine tuberculosis in New York State (*New York State Bd. Health, Fourteenth An. Rpt., vol. 2, p. 510*).—This consists of tabulated data giving in detail the statistics of herds examined and notes on *post-mortem* examinations of animals slaughtered.

The suppression of bovine tuberculosis and glanders, F. L. RUSSELL (*Maine Sta. Bul. 13, 2d ser., pp. 7*).—This bulletin consists of a general discussion of tuberculosis and glanders, and a statement of the diagnostic value of turberculin and mallein.

Contribution to the knowledge of the streptococci of yellow "galt," L. ADAMETZ (*Jour. Landw., 42, No. 3, pp. 231–241*).—A study of the microörganisms occuring in the milk of cows affected with a form of udder inflammation common in Switzerland under the name of *gelbe galt*.

DAIRYING.

Contribution to the study of the colostrum of the cow, V. HOUDET (*Ann. Inst. Pasteur, 8 (1894), No. 7, pp. 506–513*).—As first pointed out by Lassaigne[1] the formation of colostrum proper is preceded by the secretion of an albuminous liquid which sometimes begins to form 2 months before parturition. This secretion often appears under 2 forms—a brownish, viscous, honey-like product, and a lemon-yellow, non-viscous liquid, although the two are not always distinct and often coexist in the same animal, the earlier milkings furnishing the first, the later milkings the second. Examinations of samples of the viscous secretion showed it to be curdled by heating and precipitated by acetic acid, bichlorid of mercury, and alcohol, but not curdled by rennet. It was absolutely free from fat, and it contained traces of mineral matter, 63.14 per cent of water, 22.74 per cent of albuminoids soluble in water (to the extent of passing a Chamberland filter), and 14.12 per cent of albuminoids insoluble in water. The fluid secretion contained less water and less soluble albuminoids than the viscous secretion, and gave a barely appreciable precipitate with bichlorid of mercury and alcohol, but behaved in the same manner as the latter

[1] Ann. Phys. et Chim., 1837, 1841.

toward heat, acetic acid, and rennet. One hundred cubic centimeters of it contained the following amounts of dry matter:

Composition of fluid secretion preceding colostrum.

	In suspension.	In solution.
	Grams.	*Grams.*
Fat	0.15	
Lactose		0.80
Albuminoid matter	4.39	1.38
Phosphate of lime	0.03	0.08
Other salts	0.14	0.24
Solids	7.21	

The composition of the fluid colostrum is thus seen to more nearly approach that of milk. Four or five days before parturition this secretion disappears entirely and is replaced by colostrum proper.

True colostrum is described as an opaque, yellow liquid of pungent taste. Sometimes it is of brick-dust or reddish color, due to the presence of blood. Its reaction is not well defined, being sometimes acid, sometimes alkaline, and sometimes amphotere. Churning colostrum for 1½ hours gave no butter, but in a centrifugal separator a yellow butter-like product was obtained. It is curdled by heat, acetic acid, bichlorid of mercury, and rennet. The more nearly its composition approached that of normal milk the less easily it curdled on heating and the less marked its color became. The following table shows the composition (100 cc.) of the colostrum of a Norman cow 6 days before calving (true colostrum just beginning to form), 4 days before calving, and immediately after calving:

Composition of colostrum at different stages.

	Six days before calving.		Four days before calving.		Just after calving.	
	In suspension.	Soluble.	In suspension.	Soluble.	In suspension.	Soluble.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
Fat	0.50		3.01		3.14	
Lactose		2.35		3.17		2.70
Albuminoids	17.43	0.47	12.08	0.45	14.53	0.25
Phosphate of lime	0.33	0.11	0.37	0.10	0.35	0.11
Mineral salts	0.28	0.08	0.25	0.15	0.28	0.14
Solids	21.45		19.58		21.50	

These figures show a sudden increase in the amount of albuminoids over that contained in the fluid colostrum already reported (6.77 gm.). This may be due to a diversion to the udder of the nutritive material which up to this time had been supplied to the fetus and its connections. An increase in fat and phosphates and a decrease of soluble albuminoids will also be observed.

The following analyses of colostrum from a Norman cow which calved November 12 illustrate different stages of the transition of colostrum into normal milk:

Composition of colostrum at different dates.

	Fat.	Lactose.	Albuminoids.	Phosphate of lime.	Mineral salts.	Total solids.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
November 12:						
Suspended	5.69		14.05	0.39	0.44	24.60
Soluble		3.30	0.51	0.12	0.10	
November 13:						
Suspended	4.48		5.21	0.33	0.31	15.53
Soluble		4.05	0.93	0.10	0.12	
November 14:						
Suspended	5.70		3.52	0.23		16.40
Soluble		4.32	1.98	0.20	0.45	
November 15:						
Suspended	7.40		3.45	0.22		18.35
Soluble		4.26	2.41	0.21	0.40	
November 16:						
Suspended	3.20		5.20	0.26		14.10
Soluble		4.44	0.56	0.14	0.30	
November 18:						
Suspended	4.20		4.02	0.18		14.72
Soluble		4.64	1.19	0.20	0.29	
November 20:						
Suspended	4.10		3.56	0.27		13.80
Soluble		4.96	0.48	0.13	0.30	
November 28:						
Suspended	3.85		3.74	0.20		13.91
Soluble		5.03	0.58	0.15	0.36	

Analyses of colostrum from cows of other breeds are reported, confirming in general the above results.

The author concludes that after parturition the dry matter of colostrum decreases, then about the third day increases, and afterwards drops to the normal figure for milk. The quantity of fat is subject to great oscillations. The increase in milk sugar is gradual. The albuminoid matter exists both in suspension and in solution; both forms decrease after birth, the suspended albuminoids much more than the dissolved albuminoids. The phosphate of lime and other salts are abundant at first; 5 days after parturition their quantity is normal. By this time, in fact, the colostrum has gradually become normal in color and in its chemical composition and behavior toward rennet very similar to normal milk.

In conclusion, it is suggested that the changes in colostrum are the result of efforts of nature to adapt the food supply to the varying requirements of the young in the early stages of its life, the colostrum acting first probably as a purgative to remove from the intestines of the young animal the meconium which has accumulated during gestation.

On the composition of the milk of various animals, A. PIZZI (*Staz. Sper. Agr. Ital., 26 (1894), No. 6, pp. 615–639*).—Studies are reported on human milk and the milk of the goat, sheep, buffalo, mare, ass, rabbit, sow, dog, cat, and rat. All of the animals used had given birth to their young 12 to 40 days before the sample of milk was drawn. Butter was made from human milk and from the milk of the goat, sheep, buffalo, and sow. The melting point, point of solidification, and volatile fatty acids (Wollny's numbers) of the butters were as follows:

Examination of butter from different kinds of milk.

Butter made from—	Melting point.	Point of solidification.	Volatile fatty acids (Wollny).
	Deg. C.	*Deg. C.*	
Human milk	32.0	22	1.42
Goat's milk	36.5	31	28.60
Sheep's milk	29–30.0	12	32.89
Buffalo's milk	38.0	29	26.18
Sow's milk	28.0	12	1.65

Owing to insufficient supply of milk, butter was not made from the milk of the other animals, but the fat was extracted from the milk by ether and the volatile acids determined in this. Mare's milk was distinctly alkaline, and Wollny's number for the fat was 11.22. Ass's milk gave a distinct reaction with red litmus paper, and Wollny's number was 13.09. Wollny's number for the fat of the milk of the rabbit was 16.06, the dog 1.21, the cat 4.40, and the rat 2.97. Sow's milk was quite alkaline, as was also that of the cat. The following table gives the composition of the milk of the buffalo and the rabbit:

Composition of buffalo's and rabbit's milk.

	Milk of buffalo.	Milk of rabbit.
	Per cent.	*Per cent.*
Water	82.2090	69.5000
Fat	7.9500	10.4500
Albuminoids	4.1300	15.5400
Sugar	4.7500	1.9500
Ash	0.9700	2.5600
Specific gravity at 15° C	1.0332	1.0493

A microscopical examination was made of the milk of the 12 kinds of animals named above, and it was found that the fat globules were largest in the milk of the rabbit and the mouse. The globules were smallest in the milk of the sow, ass, and mare. The milk of 4 cows was examined just before parturition and at different stages after calving. Three to 6 hours before parturition Wollny's numbers for the colostrum fat were 4.40 to 4.73, 6 hours after calving 6.16 to 6.27. After this time the volatile fatty acids rapidly increased, reaching in one instance 28.16 at 114 hours after calving, in another case 28.93 in 108 hours, in another reaching 29.81 at 60 hours, and in another being only 24.75 after 189 hours.

On tubercle bacilli in milk, K. ARNELL (*Kgl. Landt. Akad. Handl. Tidskr., 33 (1894), pp. 239–243*).—The author gives an account of the methods proposed by Ilkewitsch, Thörner, and Asessi, for the examination of milk for tubercle bacilli, and recommends the following method as reliable: The milk is treated according to the Gottlieb-Röse method,[1] ammonia is added, and then alcohol, ether, and benzin; the lower layer forming under the clear ethereal solution contains all bacteria found in the milk. The layer is transferred to a conical, heavy glass tube, 10 cm. long, holding about 10 cc., and is placed in a metal cover fitting into the holes of the lactocrite disks and whirled. The residue forming at the sharp point of the tube is examined under the microscope for tubercle bacilli.—F. W. WOLL.

Water content of Schleswig-Holstein butter, O. HENZHOLD (*Milch Ztg., 23 (1894), No. 43, pp. 684, 685*).—The study of the water content of butter in Schleswig-Holstein, which was made by the experiment station at Kiel at the request of the Prussian Minister of Agriculture (E. S. R., 5, p. 952), included samples from private dairies and coöperative creameries in different parts of the province and from the station creamery, made in nearly every month of the year. In all, 101 samples were examined.[2] The 23 samples of dairy butter contained from 7.82 to 19.26 per cent of water, and averaged 12.77; and the 26 samples of creamery butter contained from 11.07 to 17.57, and averaged 13.66 per cent.

In order to observe the variations under normal conditions, 37 samples of butter were made by students in the Kiel dairy school, the water content being noted of the butter as taken from the churn, when worked once, and when salted and worked twice. This ranged for the finished butter from 5.90 to 16.81, and averaged 11.70 per cent. The butter was all made by approved methods, so that the difference in water content is believed to be due to the difference in makers, especially in working. In spring and summer the cream was churned at 10 to 12° C. (50 to 53.6° F.), and in fall and winter at 13 to 16° C. (55.4 to 60.8° F.).

In 15 other trials the effect on the water content of churning at too high a temperature or of overchurning was studied. The results follow:

Water content of butter churned and treated differently.

No. of sample.	Churning.			Water content of butter.			Remarks.
	Temperature.	End temperature.	Time.	As taken from churn.	Worked once (unsalted).	Worked twice and salted.	
	Deg. C.	*Deg. C.*	*Min.*	*Per cent.*	*Per cent.*	*Per cent.*	
1	12.0	13.5	29	21.48	18.93	15.08	Gathered for 3 minutes.
2	12.0	14.0	25	24.07	19.26	15.83	Gathered for 5 minutes.
3	12.0	13.5	30	21.77	20.45	15.30	Gathered for 3 minutes.
4	14.5	15.0	26	17.48	13.01	11.41	Do
5	15.0	17.0	22	17.77	14.98	13.41	
6	17.0	18.5	17	19.91	15.00	11.79	
7	17.0	18.5	22	29.56	29.18	18.32	
8	17.0	19.0	20	19.65	17.54	13.29	
9	17.0	18.0	30	18.66	15.93	12.25	
10	12.0	14.0	25	17.68	15.76	13.22	Butter left 2 days on ice.
11	14.0	15.0	25	16.38	15.05	13.31	Do

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[1] Landw. Vers. Stat., 40, pp. 1–27.

[2] The water was determined by heating 10 to 12 gm. of butter in a porcelain dish with 20 gm. of broken pumice stone, as described by the author in Milch Ztg., 20 (1891), p. 71.

Water content of butter churned and treated differently—Continued.

No. of sample.	Churning.			Water content of butter.			Remarks.
	Temperature.	End temperature.	Time.	As taken from churn.	Worked once (unsalted).	Worked twice and salted.	
	Deg. C.	*Deg. C.*	*Min.*	*Per cent.*	*Per cent.*	*Per cent.*	
12				19.47	13.56	11.07	Churned at ordinary temperature.
13	20.0			27.67	24.38	18.08	Same cream as No. 12.
14				17.64	14.09	11.43	Milk separated at 35° C.; churning normal.
15				22.65	16.00	12.08	Churning normal; fresh butter kept in water at 25° C. for 18 hours.

The average water content, 13.73 per cent, was only 2 per cent higher than the average where the conditions were normal.

In the 101 samples the range was 5.90 to 19.26 and the average 12.96 per cent. Of the whole number, 13 per cent had over 15 per cent of water and 5 per cent had over 16 per cent.

The water content of East Prussian butter, R. EICHLOFF (*Milch Ztg., 23 (1894), No. 46, pp. 733, 734*).—From February, 1893, to October, 1894, an investigation was made of this subject by the dairy experiment station at Kleinhof-Tapiau, with the following results:

Water content of butter from different sources.

Butter.	Number of samples.	Minimum.	Maximum.	Average.
		Per cent.	*Per cent.*	*Per cent.*
Kleinhof Tapiau creamery	36	8.52	15.34	13.29
Other creameries	6	10.66	13.37	11.95
Peasant butter	24	10.95	26.19	[1] 14.49

[1] In striking the averages all samples with over 20 per cent of water were excluded, "as it was assumed that either the churning took place under abnormal conditions or water had been purposely worked into the butter." As one fourth of the peasant butter had 20 per cent or over, the above average is not correct.

In addition to the above, the water was determined in unworked butter and in salted and unsalted butter worked once, with the following average results:

	Per ct. water.
Unworked butter	19.41
Worked once, unsalted	14.65
Worked once, salted	13.96
Ready for market	13.15

The loss of water in keeping butter packed in closed tubs in a cellar is shown as follows:

	Per cent.
Water in fresh butter	13.15
Water in butter 1 month old	12.08
Water in butter 4 months old	6.69

A sample of whey butter had 14.05 per cent of water.

Experiments in churning cream soured with hydrochloric acid, H. TIEMANN (*Milch Ztg., 23 (1894), No. 44, pp. 701, 702*).—Experiments with this method have been reported (E. S. R., 6, pp. 248, 249). Twenty one trials were made by the author at the request of Dr. Weigmann. The cooled separator cream was run into the churn and mixed with hydrochloric acid until the desired acidity for churning was obtained. The acid was made by diluting 1 part of pure acid of 1.124 sp. gr. with 2 parts of water. The water content of the butter worked once ranged from 13.31 to 17.42 per cent, and of the butter ready for market from 12.18 to 13.76 and averaged 12.65 per cent. The fat content of the buttermilk (undiluted) ranged from 0.45 to 1.02 per cent and averaged 0.76. This buttermilk could not be sold, so the acid was neutralized with bicarbonate of soda, 6 per cent of "common acid" (starter?) added, and after standing 24 hours run through the churn again. This buttermilk sold readily.

The butter had no aroma. The taste was pronounced "fair" to "good," but there was usually a slight aftertaste, and the butter was more or less oily. Some of the samples were entered at the butter exhibition in Hamburg when from 3 to 9 days old. They were pronounced by the judges from "medium" to "fairly good," although here the absence of aroma and the oiliness were mentioned.

Trials in which a strong acid was used were not satisfactory, as a disagreeable odor was developed.

Experiments in churning cream soured with hydrochloric acid, TAMM (*Milch Ztg., 23 (1894), No. 47, pp. 750, 751*).—A practical trial lasting 2 weeks was made of this method at a creamery. After some experiments an acidity of 12 to 13° (Soxhlet's), brought about by adding 5.5 cc. of hydrochloric acid per kilogram of cream, was adopted. The fat in the buttermilk ranged from 0.37 to 0.65 per cent. In all but 2 cases the butter was normal; it had a pure, clean taste, and had not changed in 14 days, but it had no aroma. It contained 2 to 3 per cent more water than butter made as ordinarily. No free hydrochloric acid was found. The author believes the method has advantages, but is not ready to recommend its general adoption until further trials have been made, which will follow with the aid of a pasteurizing apparatus.

On the vegetable cheese, "natto," K. YABE (*College Agr., Tokyo, Japan, Bul., vol. 2, No. 2, pp. 68–72*).—The author states that since remote times there has been prepared in Japan a sort of vegetable cheese called "natto," from the seeds of the soja bean. "The beans are first boiled in water for 5 hours to render them exceedingly soft. The still hot mass is in small portions wrapped in straw and the bundles thus formed, well tied at both ends, are then placed in a cellar, in the middle of which a fire is kindled, whereupon the cellar is well closed. The heat is left to act for 24 hours, after which the product is ready for consumption."

The author has found 4 kinds of bacteria in this cheese, and has studied the changes which they induce in the nitrogenous compounds in making the cheese. Considerable peptone, and also leucin and tyrosin were found, which are believed to be undoubtedly the result of bacterial action, and xanthin and hypoxanthin, which "probably were originally present in the soja bean." In conclusion the percentage of the different nitrogenous compounds in the beans and the natto is given as follows:

Nitrogenous compounds in soja bean and vegetable cheese.

	In soja bean.	In natto from same soja bean.
	Per cent.	*Per cent.*
Total nitrogen	7.355	7.542
Nitrogen in proteids (excluding peptone)	6.899	4.033
Nitrogen in amids	0.128	1.892
Nitrogen in peptone	0.328	1.617

Determination of the degree of ripeness and the fat content of cheese, C. VON MUZAKÖZY (*Ztschr. Nahr. Untersuch. und Hyg., 8, pp. 266–268; abs. in Chem. Centbl., 1894, II, No. 20, p. 851*).—The ripening of cheese, according to the author, consists principally in that a part of the casein which is insoluble in dilute acids changes to a soluble form. The digestibility of cheese has a direct connection with this solubility of the albuminoids. The disturbances from eating overripe cheese are due, he states, to the fat of the digestive fluids becoming saturated with soluble protein compounds. Hence he proposes to determine the ripeness of cheese by the amount of soluble albuminoids. To this end the broken up cheese, extracted of fat and dried, is used for determining ash and milk sugar, and another portion is washed on a tared filter with 0.5 per cent acetic acid, and the residue and its ash determined. From this the amount of soluble albuminoids is calculated. The fat is determined, according to Soxhlet's aërometric method, by treating 25 gm. of finely grated cheese with 160 cc. of water, 25 cc. of potassium hydrate, and 60 cc. of ether, and then proceeding as with milk.

The greening of Lombardy cheese and the cleaning of copper utensils, SARTORI (*Abs. in Milch Ztg., 23 (1894), No. 44, pp. 703, 704*).—Additional proof that the greening of cheese is due to the use of copper utensils which are brightly scoured with sand. Green cheese is said to sometimes contain 100 to 110 mg. of copper per kilogram, while the average is 22 mg. The copper is said to be in the form of hydrocarbonate (verdigris). When the vessels are not scoured with sand, but are scalded out with water an oxid soon forms which protects the copper, and not enough is dissolved to color the cheese. In some factories this has been adopted instead of scouring.

Biochemic investigations of ropy milk, N. BOCHICCHIO (*Staz. Sper. Agr. Ital., 27 (1894), No. 4, pp. 339–368*).—This is largely a study of *Bacterium hesii* and *Micrococcus freudenreichii* and of their effect on various solutions.

A convenient milk sampling tube, M. A. SCOVELL (*Agl. Sci., 8 (1894), No. 6–9, pp. 355, 361*).—The apparatus consists of a long copper tube about three fourths inch in diameter, sliding into a cap closed at the lower end. This cap has 3 elliptical openings in the sides. In taking the sample the cap is drawn partly off so that the apertures are opened. The tube is then inserted in a can of milk and the inner tube pushed down into the cap, closing it, and holding a column of milk.

This tube was used in connection with the test of breeds at the World's Fair. Tables are given showing its accuracy. It is claimed that the tube will take a fair average sample of the milk as milked from the cow without mixing, even after standing some time.

A review of the bacteriology of cheese, N. BOCHICCHIO (*Staz. Sper. Agr. Ital., 27 (1894), No. 4, pp. 434–445*).

Ventilation of cheese cellars, W. HELM (*Milch Ztg., 23 (1894), No. 50, pp. 795, 796; No. 51, pp. 813–815; No. 52, pp. 828, 829; also Molk. Ztg., 8 (1894), No. 50, pp. 765–767; No. 51, pp. 785, 786*).

AGRICULTURAL ENGINEERING.

Massachusetts College barns (*Massachusetts Agl. Col. Rpt. 1894, pp. 44–51*).—The new farm buildings of the Massachusetts Agricultural College, recently completed at a cost of about $35,000, consist of a horse barn, 41 by 91 ft., and a large storage and cattle barn. These buildings are frame with steel roofing, are lighted by electricity, and were constructed with special reference to the welfare of the animals and the saving of labor in feeding the stock and handling the manure.

The main part of the cattle barn is 141 by 61 ft., and consists of a basement and two stories. The topographical condition of the site allowed a driveway of an easy grade to be constructed at the east end, leading to the upper floor, 22 ft. above the main floor. This enables the storage of hay, silage, grain, stable absorbents, and bedding with the minimum amount of labor. At the western end 20 ft. of the loft is floored over so that wagons can be turned around and driven out by the east door, as the floor at the west end is 31 ft. above the ground.

On the right of the interior driveway, which is 14 ft. wide, are traps communicating with large bins for grain, a set of Fairbanks hay scales, and ample space for the operation of heavy barn machinery, where are placed a 15-horsepower electric motor, silage cutter, cornsheller, grain mill, thresher, etc. Further on are 3 silos which extend to the basement and will hold 425 tons of silage. The rest of that side, together with nearly all of the space on the left of the driveway, is occupied by haymows, in which 240 tons of hay can be stored.

The folding door shown on the south side near the east end, opposite which is a similar door, is approached by a very easy-graded driveway held by a curved retaining wall, and admits to a floor 11 ft. wide and 12 ft. above the main floor. Below this cross floor is a very capacious vegetable cellar, reached by traps in the cross floor and through a door on the main floor. From this driveway access is also had to the second floor of the granary. When not otherwise in use this cross floor is occupied by carts, wagons, etc. The main basement is also used for the storage of implements and machinery.

Inspection of the photograph and plan will give an idea of the arrangement of the cow stable, which is 135½ by 43 ft., but there are several features that should be specially mentioned. The roof is of steel, under which is building paper and boards, then a 6 in. air space, then building paper and matched boards, then an inch and a half air space and then lath and plaster. All the ceilings and the wall of the monitor roof are of adamant cement, painted, and the walls of the stable are of matched North Carolina pine sheathing, oiled. There is no basement, and the cement passages and gutters are built upon solid earth and masonry. The gutters behind the cows incline toward the center, where they empty into cisterns on either side of the building, thus saving all the liquid manure. By making the floor of the sheds at the south end 9 ft. below that of the stable it is convenient to carry all the solid manure in barrows and dump into carts or manure spreaders for immediate distribution. The stalls, of which there are 65, are fitted with a V-shaped cement feed and water trough, provided with movable dividing frames to permit of thorough cleansing.

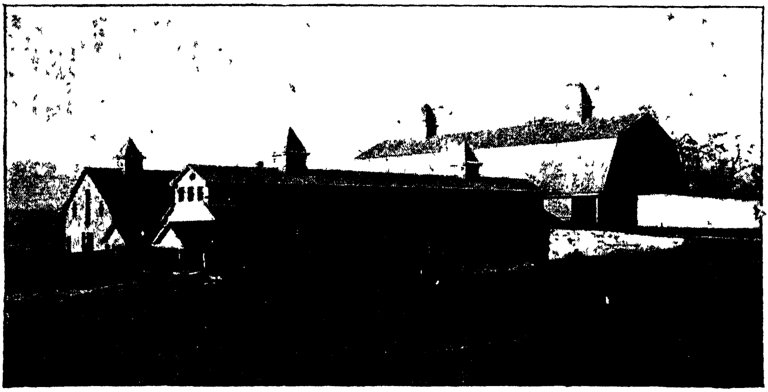

FIG. 1.—Exterior of Massachusetts College stock barn.

Stanchions of various patterns are used in the stalls, but most of the animals are fastened with the Walters tie, arranged so that each animal may be liberated separately or entire sections at once by a single motion of the lever.

The upper windows are hinged at the bottom and moved by Ormsby's ventilating apparatus, the upper sashes of the lower windows being hinged at the bottom and moved individually by transom lifts, and the lower sashes are protected by iron gratings and slide into the partitions. Trapdoors, moved by cords and pulleys, are also placed in the cupolas. This arrangement secures perfect ventilation without draft on the animals. There is 1,233 cu. ft. of air space for each animal kept in this building.

The arrangement of doors is such that hay, silage, grain, absorbents, etc., are conveniently brought from the main floor of the storage barn on trucks, and green food can be brought in on wagons through the south door.

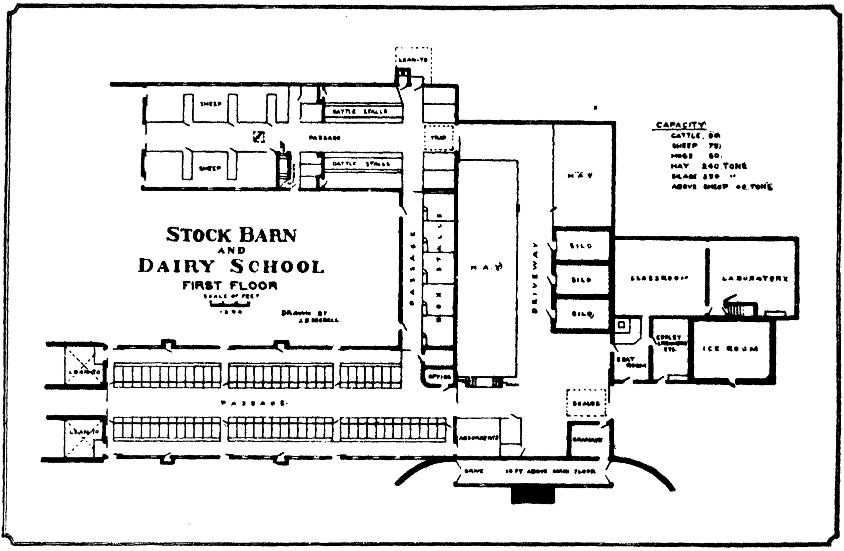

FIG. 2.—Ground plan of Massachusetts College stock barn—first floor.

A sheep barn 121 by 41 ft. is connected with the cow barn by a lean-to containing a passage and 5 box stalls fitted with plank mangers and Buckley's self-feeding watering devices. This barn contains 2 large and 5 small pens, sufficient for 75 sheep, stalls for 20 young cattle, and 4 stalls for bulls on the main floor; pigpens, slaughter room, root cellar, and swill room in the basement; and a loft large enough for 40 tons of hay. Doors open at the south end into dry and sheltered yards. The large sheep pens are provided with Hall's patent sheep racks. The cattle stalls are arranged like those in the other stable, except there are troughs of plank which have permanent partitions. The entire basement has a solid cement floor, which in the pigpens slopes to the center, where there are half-round gutters for carrying all the excreta to pits. About half of each pen has a raised plank floor, and the gutters are covered with hinged plank.

Ventilation is secured by similar devices to those used in the cow stables. Reference to the above plan and that on page 677 will show that the arrangement of doors and passages is such as to permit the passage of wagons on both basement and main floors.

The basement and one story northern extension (63 by 56 ft.) are devoted to dairy purposes. In the basement are boiler room, with 100-horsepower boiler which supplies steam and hot water for all purposes; engine room, in which there is a 75-horsepower engine, supplying power to run the 616-candlepower alternator and 416-candlepower generator; ice room, holding 300 tons of ice; and separator and churn rooms.

On the main floor are a class room, laboratory, coat room, and upper part of ice room. The dynamos furnish electricity for lighting the farm buildings and the central college buildings, and for operating the large motor in the barn and the 7½-horsepower motor in the separator room, which is used for driving all dairy machinery. Sinks with hot and cold water and steam are in all parts of this building. The class room and laboratory are of ample size, well lighted and ventilated, and are well adapted to instruction in all branches of dairy work, including chemical and microscopic examination of milk and its products.

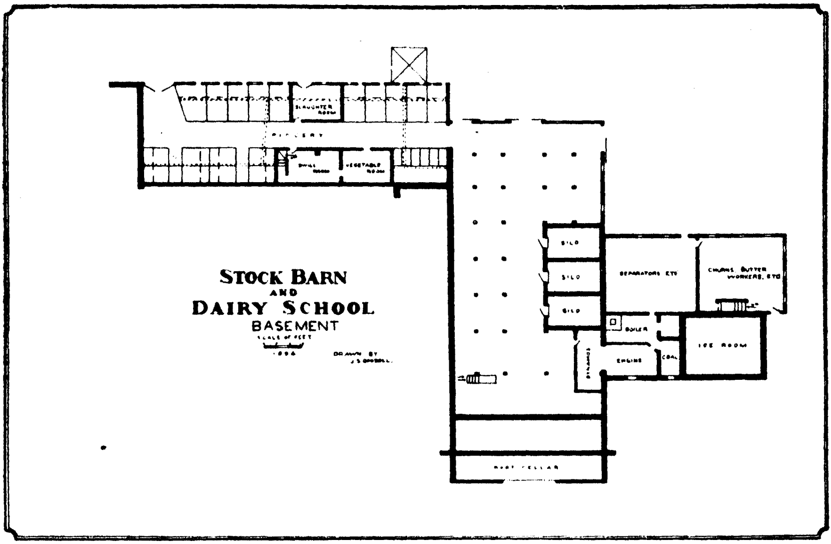

FIG. 3.—Ground plan of Massachusetts College stock barn—basement.

Proceedings of the National Road Conference, Asbury Park, New Jersey, July 5 and 6, 1894 (*U. S. Dept. Agr., Office of Road Inquiry Bul. 10, pp. 63, figs. 3*).—An account of proceedings, including the text of the various resolutions passed and addresses delivered by representatives from different States.

Roads and road making, D. O. NOURSE (*Virginia Sta. Bul. 34, pp. 137–139*).—Brief and simple directions for the improvement of dirt roads.

STATISTICS.

Annual Report of Florida Station (*Florida Sta. Bul. 24, pp. 31*).—Short reports by the director and heads of the several departments and substations, some of which are mentioned elsewhere.

Sixth Annual Report of New York Cornell Station (*New York Cornell Sta. Rpt. 1893, pp. 365*).—This includes a brief report by the director and members of the station staff, the treasurer's report for the fiscal year ending June 30, 1893, including a detailed statement of the receipts and expenditures, and reprints of the bulletins of the year.

Sundry investigations of the year (*New York Cornell Sta. Rpt. 1893, pp. 303–345, figs. 20*).—A reprint of Bulletin 61 of the station (E. S. R., 5, pp. 862, 867, 874, 879, and 883).

Imports of corn into Europe (*U. S. Dept. Agr., Division of Records and Editing Circular 147*).

NOTES.

ARIZONA STATION.—New substations have been established at Mesa and Yuma, the former in a block of 10 acres provided by the city, the latter upon a tract of land belonging to the Territorial prison. The prisoners will perform the labor required at Yuma.

MISSISSIPPI STATION.—The station has recently used the tuberculin test on a herd of 62 cows, mostly grade Jerseys, belonging to the agricultural college. Not a single suspicious case was found, the greatest rise in temperature being only 1 degree. Arrangements have been made for continuing the work with other herds in order to ascertain what foundation, if any, exists for the claim so often made by Southern stock breeders that cows raised in the South are less liable to tuberculosis than those grown in the North.

NEW HAMPSHIRE STATION.—Owing to the resignation of Professor Whitcher and Professor Wood and the burning of the farm barn, it will be necessary both to reorganize and to reequip the agricultural department.

PENNSYLVANIA STATION.—J. W. Fields, assistant chemist at the station, has resigned and accepted a position as consulting chemist with a firm of chemical fertilizer importers in New York City.

RHODE ISLAND COLLEGE.—College Hall, the main building of the Rhode Island Agricultural and Mechanical College, occupied as a dormitory and recitation rooms, was destroyed by fire January 27, 1895. The building was of stone, four and a half stories high, and cost about $45,000. A portion of the apparatus was saved, but much of the students' furniture and personal effects was lost. The State carried no insurance on the property. Temporary accommodations have been put up. It is proposed to erect a dormitory without recitation rooms on the site of the old building, and a drill hall 130 by 40 ft., the lower story of which will be devoted to chapel and recitation rooms, and the basement to carpenter shop for the mechanical department, bath rooms, etc.

IMPERIAL INTERNATIONAL EXHIBIT OF AGRICULTURAL MACHINES AT VIENNA.—The Imperial Agricultural Society of Vienna, under the patronage of His Imperial Highness the Archduke Carl Ludwig, will hold in Vienna on May 4, 5, 6, and 7, 1895, an international exhibition of agricultural machinery. The exhibition will be divided into the following departments: Agriculture and agricultural industries; forestry and forest industries; fruit and viticulture; animal industry; dairying; fish culture; veterinary work and horseshoeing; electricity as applied to agriculture and forestry; and an annex for seeds and artificial manures.

PERSONAL MENTION.—H. Molisch has been chosen professor of vegetable anatomy and physiology, and director of the institute of vegetable physiology of the University of Prague.

EXPERIMENT STATION RECORD.

VOL. VI. No. 8.

The act of Congress making appropriations for the United States Department of Agriculture for the fiscal year ending June 30, 1896, carries the following general items: For the Office of the Secretary of Agriculture, $94,140; Weather Bureau, $885,610; Bureau of Animal Industry, $812,000, including $12,000 for quarantine stations; Office of Experiment Stations, $30,000 ($15,000 is also appropriated for the continuance of the investigations on the nutritive value of human foods which are carried on through this office largely in coöperation with the agricultural colleges and experiment stations); Division of Statistics, $145,160, of which $10,000 may be expended in continuing the investigations concerning the feasibility of extending the demands of foreign markets for the agricultural products of the United States; Division of Entomology, $29,500; Division of Chemistry, $32,000, of which $5,000 is for the continuance of investigations of the adulterations of foods, drugs, and liquors, and $5,000 for the continuance of the investigations relative to the various typical soils of the United States, to determine their chemical characteristics, and especially the nature of the nitrifying organisms contained therein ($10,000 is also appropriated to continue experiments in the manufacture of sugar); Division of Botany, $33,800; Division of Forestry, $33,520; Division of Ornithology and Mammalogy, $27,560; Division of Pomology, $12,500; Division of Vegetable Physiology and Pathology, $26,500; Division of Microscopy, $7,300; Division of Agricultural Soils, $15,000; Division of Agrostology, $15,000; Division of Seeds, $199,120, of which $50,000 may be expended for the preparation, printing, and publishing of farmers' bulletins, two-thirds of which shall be supplied to Senators, Representatives, and Delegates in Congress for distribution among their constituents as seeds are distributed; Division of Publications, $8,300; for illustrations and engravings, $15,000; Document and Folding Room, $9,040; Division of Accounts and Disbursements, $17,300; library, $6,000; museum, $5,400; experimental gardens and grounds, $32,000; irrigation investigations, $15,000; inquiries relating to public roads, $10,000; furniture, repairs, postage, and contingent expenses, $37,000; total, $2,578,750. The act also contains an appropriation of $720,000 for the agricultural experiment stations established under the act of Congress of March 2, 1887.

It will be observed that under this appropriation act a new division will be established in the Department, namely, the Division of Agrostology, which will conduct field and laboratory investigations relating to the natural history, geographical distribution, and uses of the various grasses and forage plants and their adaptability to special soils and climates; and that the Division of Agricultural Soils, which has hitherto been connected with the Weather Bureau, will be an independent division. The Division of Records and Editing has added to its other duties the general charge of illustrations and the publication and distribution of farmers' bulletins. It will hereafter be designated as the Division of Publications.

The provisions of the act of Congress of March 3, 1891, relative to meat inspection have been amended so as to read as follows:

"SEC. 2. That the Secretary of Agriculture shall also cause to be made a careful inspection of all live cattle the meat of which—fresh, salted, canned, corned, packed, cured, or otherwise prepared—is intended for exportation to any foreign country, at such times and places, and in such manner as he may think proper, with a view to ascertain whether said cattle are free from disease, and their meat sound and wholesome, and may appoint inspectors who shall be authorized to give an official certificate clearly stating the condition in which such cattle and meat are found, and no clearance shall be given to any vessel having on board any fresh, salted, canned, corned, or packed beef being the meat of cattle killed after the passage of this act for exportation to and sale in a foreign country from any port in the United States until the owner or shipper shall obtain from an inspector appointed under the provisions of this act a certificate that said cattle were free from disease and that their meat is sound and wholesome.

"SEC. 4. That said examination shall be made in the manner provided by rules and regulations to be prescribed by the Secretary of Agriculture, and after said examination the carcasses and products of all cattle, sheep, and swine found to be free of disease and wholesome, sound, and fit for human food shall be marked, stamped, or labeled for identification, as may be provided by said rules and regulations of the Secretary of Agriculture. Any person who shall forge, counterfeit, simulate, imitate, falsely represent, or use without authority, or knowingly and wrongfully alter, deface, or destroy any of the marks, stamps, or other devices provided for in the regulations of the Secretary of Agriculture, of any such carcasses or their products, or who shall forge, counterfeit, simulate, imitate, falsely represent, or use without authority, or knowingly and wrongfully alter, deface, or destroy any certificate or stamp provided in said regulations, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine not exceeding one thousand dollars, or imprisonment not exceeding one year, or by both said punishments, in the discretion of the court."

The Secretary of Agriculture is also authorized "to make such rules and regulations as he may decide to be necessary to prevent the transportation from one State or Territory or the District of Columbia into any other State or Territory or the District of Columbia, or to any foreign country, of the condemned carcasses or parts of carcasses of cattle, sheep, and swine which have been inspected in accordance with the provisions of this act."

AGRICULTURAL INVESTIGATION IN SWITZERLAND.

DR. A. GRETE,
Director of the Swiss Agricultural-Chemical Experiment Station of Zurich.

Agricultural investigation in Switzerland was until very recently comparatively undeveloped, if we exclude experiments conducted on private estates, which could scarcely claim to be of scientific value. The first attempts at a scientific treatment of important agricultural questions were made at the experiment station established in connection with the agricultural school of the Canton of Bern at Rüti, near the city of Bern, but for a long time this station did not do more than make analyses of various kinds, the real experimental feature being allowed to fall into the background.

At this period Schatzmann, director of the Dairy Experiment Station at Lausanne, materially advanced the cause of the dairy industry by lectures, consultations, etc., at various places, and also by maintaining a depot for dairy utensils for demonstration and for sale. For a long time after the death of Schatzmann[1] there was no conspicuous advocate of the dairy industry of Switzerland, and little was done in experimental inquiry at the Rüti Station, although that station had been extended to embrace dairy investigations. In 1887, however, there was a revival of this subject when Schaffer, Bondzynski, and Freudenreich commenced the publication in *Landwirtschaftliches Jahrbuch der Schweiz* of accounts of the following investigations:

By Schaffer: Concerning casein and the effect of rennet on cows' milk (1887); Contributions to the knowledge of the effect of rennet, and of the process of ripening of cheese (1888); Udder inflammation of cattle and its importance in agriculture (1888); Concerning the effect on milk of the internal use of bitter and aromatic medicines (1888). By Bondzynski and Rufi: Concerning the method of Werner-Schmid for the determination of fat in milk (1889). By Bondzynski: Concerning the nature of butter fat (1889). By Schaffer and Bondzynski: Concerning the physical and chemical changes of milk due to milk defects and udder inflammation in cattle and goats (1890). By Freudenreich: Concerning a new bacillus found in swelled cheese (1890).

At various times, and especially in the year 1882, steps were taken by the Swiss Agricultural Society to induce the general government to establish a federal dairy station for theoretical and practical work, but the carrying out of this plan has been deferred from time to time. Later an attempt was again made to combine with the agricultural experiment station an animal industry station with the addition of the necessary land, principally for the carrying out of feeding experiments, and to establish an Alpine agricultural experiment station. The last projects are still far from realization, but a division for dairy investigations established in connection with the Agricultural Institute at Lausanne (Dr. S. Bieler, director) in 1889 has made notable progress.

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[1] The more important of Schatzmann's articles were published in the *Alpwirtschaftliche Monats-blätter*.

By the decree of August 23, 1888, a dairy experiment station was established at the Lausanne Agricultural Institute in connection with the existing Wine Experiment Station (Dr. J. Dufour, director), and in September, 1888, an order issued by the Council of State of the Canton of Vaud provided that this station should consist of (1) a bureau for information, investigation, and technical expert opinion in the dairy industry; (2) a collection of apparatus and necessary utensils for dairying; (3) a chemical laboratory for investigations and experiments in dairying; and (4) a laboratory for experiments in the technology of dairying. Provision was made for an expert to direct the technical work in dairying, at a salary of from $600 to $1,000 per year; a chemist, at $600 to $1,000; a chemist's assistant, at $300 to $400; and a laboratory assistant, at $120 to $200.

This order further provided that the appliances of the station and its experiments and collections should be utilized for the purpose of agricultural instruction; and that practical cheese schools should be established in the cantons after consultation with the community or the society of cheese manufacturers.

The Department of Commerce and Agriculture was charged with the enforcement of this order, and with general supervision of the station, although the Council of State is responsible for its personnel.

The position of director was filled in April, 1889, and in November, 1889, the Dairy Experiment Station (Dr. G. Martinet, director) in connection with the Agricultural Institute of Lausanne was opened. Later an agricultural station (Dr. E. Chuard, director) was added to it.

The official journal for the Dairy Experiment Station was *Chronique Agricole et Viticole*, a monthly publication dating from the latter part of 1888. In 1891, however, there was added to this station a forestry experiment station, coöperating with the forestry experiment station at Zurich, and the name of the official organ was changed to *Chronique Agricole du Canton de Vaud.*

As regards viticulture, west Switzerland has had for a long time a school of instruction in the Viticultural Station of Lausanne, but not until 1891 did east Switzerland obtain such in the Experiment Station and School for Fruit, Wine, and Garden Culture, in Wädensweil, on the Lake of Zurich, conducted by Prof. Dr. Müller-Thurgau, both of these being cantonal institutions. During its short existence this experiment station has already done good service for native fruit and vine culture, especially in regard to vine and fruit tree management, and wine and must improvement. The reports of the station appear in the *Sweizerische Zeitschrift für Obst- und Weinbau*, which, under the name of *Monatsschrift für Obst- und Weinbau*, was for twenty-five years the organ of the Swiss Fruit and Wine Culture Association.

A few years since an experiment garden for demonstration was acquired by the teachers of fruit and wine culture in the agricultural school of the Polytechnic Institute of Zurich, and the professor of agriculture has been provided with an experimental field at Strickhof, near Zurich.

The great development which the fertilizer industry has lately made in Switzerland has been accompanied by a similar expansion of official control. Prior to 1878 many domestic factories of artificial manures existed, and foreign firms shipped their product into Switzerland, but nowhere was there any control of their production, or, at least, only so far as individuals saw fit to have tests made at their own expense. It was, therefore, a step in the right direction when the so-called warehouse control was established. Under this system a chemist of the Polytechnic Institute undertook a partial inspection of fertilizers in the factories whose proprietors would consent to the investigation, and these results were made public. It is evident, however, that such a control offered no security to the purchaser, for the product found in the warehouse could be subjected to many changes before being sold to the farmer.

It was, therefore, a decided advance when in 1878 a federal agricultural control station for fertilizers and feeding stuffs, and a seed control station under separate direction, were established by the government, and authorized to arrange with the interested firms a system of control by which the farmer obtained the advantage of a free examination of the purchased goods. To these federal stations two cantonal stations have been added, an experiment farm at the Agricultural Institute at Lausanne, and a station at Rüti near Bern, coöperating with the Chemical Experiment Station of Bern (Prof. Dr. Rossel, director). The latter had been organized the previous year and is confined to the Canton of Bern and the surrounding country, while the federal institution extends its work over all the cantons of Switzerland, including Bern. Recently the work of the station has been extended to include especially culture tests of soils, and for this purpose an experiment garden with greenhouses adapted to pot culture has been provided.

The Federal Seed Control Station and the Agricultural Experiment Station of Zurich were established by a resolution of the federal council of March 17, 1877, at the federal Polytechnic Institute at Zurich. They were placed under the supervision of the Swiss school council, which, since 1885, has exercised its control through a supervisory commission. The management of each of these stations is intrusted to a director chosen by the federal council, who, with his assistants, transacts the current business.

THE FEDERAL SEED CONTROL STATION.

The extraordinary encouragement this station received from the farmers and the dealers of Switzerland and foreign countries caused a rapid growth of the institution and made enlargement of accommodations and working force necessary. At present there are in the station the director (Dr. G. Stebler), 1 male assistant, 6 female assistants, and 1 clerk. The seed control station is now located in the chemical building of the Polytechnic Institute and is well supplied with all apparatus and other material necessary. It possesses besides a greenhouse for the carrying on of germination experiments, a small experiment field near by for culture tests, and two more distant experiment fields, one near Pfäffikon, for the culture of litter plants, and the other on the Fürstenalp at Graubünden, for Alpine culture.

The following table shows the work of the years 1879–'93:

Work of Swiss Seed Control Station.

Years.	Firms under contract.	Number of packages.	Control tests.
1879	31	1,056	867
1880	36	1,343	903
1881	46	1,465	400
1882	53	1,792	390
1883	53	1,809	625
1884	55	1,883	432
1885	50	1,877	458
1886	56	2,247	655
1887	60	2,74[illegible]	759
1888	58	3,150	(?)
1889	67	4,009	1,176
1890	64	4,611	1,823
1891	72	4,849	1,486
1892	73	5,579	1,365

The annual reports of the seed control station appear in *Schweizerische landwirtschaftliche Zeitschrift.*

The scientific work of the station is directed principally to the investigation of forage plants and to culture tests on the experiment fields.

The following articles, for the most part jointly prepared by Dr. Stebler and Prof. Dr. Schröter, have appeared in *Landwirtschaftliches Jahrbuch der Schweiz:*

Contributions to the knowledge of meadows and pastures of Switzerland: Method and object of the investigation of meadows and pastures of Switzerland (1887); Investigation concerning the influence of manure on the structure of the stigmas of meadow grasses (1887); Concerning the influence of irrigation on the structure of the stigmas of meadow grasses (1887); Influence of grazing on the structure of turf (1887); A heavy yielding form of French rye grass (1888); Influence of the size of the seed kernel on the yield of green fodder by white horse tooth corn (1888); Borst grass (*Nardus stricta*), a bad enemy of our Alpine agriculture (1888); and The Fürstenalps and the culture of forage plants on the Alpine experiment field of the same (1889).

THE SWISS AGRICULTURAL-CHEMICAL EXPERIMENT STATION OF ZURICH.

In the early history of this station the director gave the closest attention to the development of the control relation between the station and the merchants, and also to increasing the efficiency of the control. It was obvious that a thorough inspection of all the fertilizers and feeding stuffs which came on the market could not be obtained by pressure from the station, so the attempt was made to induce the business houses to voluntarily submit all their goods to inspection by the station, under a contract by which the purchasers could afterwards have the goods examined by the station free of cost, and which bound the firms to pay indemnity to the purchaser should the wares prove to be below the guaranteed grade.

On the basis of such a contract the purchasers are offered fertilizers and feeding stuffs of guaranteed composition, with a free control analysis, provided they fulfill certain formalities as to drawing the sample, packing the same, witnesses, etc. In case the goods fall below the guaranty, the contracting firms, so-called "control firms," agree to pay the purchaser an indemnity depending upon the extent of the shortage. If the shortage is within certain limits, given below, the indemnity is only partial and is fixed by a prescribed tariff; but if the shortage exceeds these limits the indemnity covers the total value of the shortage. The limits are as follows:

	Per cent.
In fertilizers:	
For phosphoric acid and potash	0.5
For nitrogen in fertilizers containing 5 per cent or more	0.5
For nitrogen in fertilizers containing less than 5 per cent	0.3
In feeding stuffs:	
For protein	2.5
For fat	0.5

The value of the excess of one constituent may, to a certain degree, be used as an offset to the indemnity required for shortage of another, provided the above limits are not exceeded; otherwise indemnity may be demanded to the full value of the shortage.

For the convenience of the purchaser a certificate is given by the factory, which, after being filled out by the purchaser and the witnesses of the sampling, entitles him to a subsequent examination of the sample free of charge. Nevertheless, the purchaser can without special permission from the factory, by right of one of the regulations, have an examination of the goods made by forwarding to the station the invoice with certificate of witnesses of the sampling.

The station also twice a year makes known to the farmers the price list of all the "control" firms, warning them that the fertilizers and feeding stuffs of these firms only will be given free control analyses by the station. The results of the examinations are officially reported to those sending samples.

The equipment of the station.—The station was originally installed in a small room of the agricultural school, but it has gradually spread itself into a large number of workrooms. Hand in hand with this expansion, there has been a steady increase of the working force until, at the present time, the personnel of the station consists of a director (Dr. A. Grete), 5 permanent assistants, 2 clerks, 1 helper, and 1 botanical assistant, besides 5 temporary assistants employed during the spring.

For such extended work the old apartments in the agricultural school of the Polytechnic Institute were not sufficient, and consequently in 1886 new quarters were secured in the new federal chemical building. The experiment station was assigned the entire first floor, about 98 feet long and 33 feet wide, and the larger part of the basement.

The first floor contains the director's office, to which is attached his private laboratory; a dark room for spectroscopic and similar work; a large room for collections, and a smaller one used for storage of the delicate apparatus, and also, since 1890, for the microscopic examination of the feeding stuffs, under the charge of a special botanical assistant; and various laboratories so arranged that each investigation which the station is most frequently called upon to make may have its special department, devoted to its special purpose and equipped according to the needs of the case. This arrangement relieves the other laboratories of all determinations not directly bearing on the investigations to which they are devoted. One laboratory is devoted almost exclusively to the determinations of water-soluble phosphoric acid, the solutions being made in the cellar and sent direct to the chemist, for analysis, by means of an elevator. This laboratory has lately been provided with a large revolving titration machine, which is arranged to simultaneously titrate 10 samples with molybdic acid solution, as described by the author in *Berichte der deutschen chemischen Gesellschaft.*

There is also a large and well-equipped general laboratory in which chiefly determinations of phosphoric acid insoluble in water are made. This laboratory is furnished with 3 double worktables, standing in the middle of the room, and 4 hoods. Each assistant is thus provided with a hood, under which is arranged a sand and water bath. This laboratory is also provided with a blast, driven by a water motor, and has distilled water on tap at two points.

A similarly equipped laboratory is set apart for potash determinations, although it is often utilized for some other purposes. The atmosphere of this room is kept ammonia-free. A room opens off this large laboratory which is furnished principally with the apparatus required for nitrogen determinations. In hoods are the necessary furnaces, ovens, etc. On a large table in the middle of the room are arranged distilling apparatus[1] and condensers, and racks with standard solutions for titrating.

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[1] As distillation flasks, the so called Erlenmeyer flasks of tinned copper, first suggested by the author, have been used for a long time with excellent results.

Adjoining these 3 laboratories is the weighing room, which has space for 12 balances. Here, also, is a small library of reference books needed in ordinary laboratory work.

The washing of apparatus is done in a special wash room.

In a room adjoining the general laboratory the purely clerical work is done. The assistants prepare detailed reports of results on small sheets at their worktables, fasten these sheets together, and hand them into the record room, where they are entered in special books bearing the numbers of the assistants.

The basement space allotted to the station is devoted principally to appliances for drying and preparing samples for analysis, force pumps, distillation apparatus, storage, and a technological laboratory.

Coarse fodders are prepared for analysis by being passed through a cutting machine, and after thorough drying finely ground by a Grüson Excelsior mill. Granular, dry, not too hard materials are immediately put through the same machine. The finest powder is prepared by the Dreefs mill. With superphosphates these machines can not be used, as their iron parts are attacked by the acid, and the final results might be affected. For these materials a mill in which the fertilizer comes in contact only with porcelain has been devised, which has given excellent results. These mills are all operated by a water motor.

The still used was made from special designs by the author, and is arranged not only to distill liquids directly or with steam, but to rectify them at the same time. The same apparatus is also arranged to accommodate evaporating dishes of different sizes, and may be connected with a vacuum, without, in most cases, interfering with the distillation of water or other solutions.

All the apartments are provided with complete electrical service.

The work of the institution.—Convinced of the security afforded by the above described control of fertilizers and feeding stuffs, the farmers have year by year more fully availed themselves of the privilege of having the guaranties accompanying purchased goods confirmed by the station analysis, so that at present in many localities no one thinks of using fertilizers on a large scale without taking advantage of such examinations. For this reason the number of analyses each year is very large.

In the year 1878 only 47 samples were received for examination. The numbers received during succeeding years were as follows:

Summary of station work.

Years.	Investigations.	Quantitative determinations.	Free control analyses.
1879	180	640	57
1880	254	920	94
1881	604	2,090	316
1882	690	2,800	438
1883	642	2,762	389
1884	803	4,419	457
1885	900	5,005	652
1886	1,140	6,250	926
1887	1,260	6,881	980
1888	1,323	7,604	1,077
1889	1,595	9,108	1,237
1890	1,867	10,012	1,333
1891	2,296	12,727	1,678

The number of "control firms" who gave the farmers the right to free analysis was as follows:

Number of control firms.

Years.	Fertilizer firms.	Feeding stuff firms.	Total.
1878	5	0	5
1879	10	3	13
1880	12	4	16
1881	17	6	23
1882	19	5	24
1883	20	7	27
1884	20	7	27
1885	24	10	34
1886	22	6	28
1887	22	6	28
1888	20	5	25
1889	20	5	25
1890	23	5	28
1891	23	6	29

Besides this annual routine analytical work the station has carried out a series of scientific practical investigations, among which are the following reported by Dr. Grete in articles published for the most part in *Landwirtschaftliches Jahrbuch der Schweiz*, 1887–'88: Experiments concerning the proper time to cut hay; Investigations of the composition of Swiss litter plants; Investigations concerning liquid manure; Experiments concerning the preservation of green food by means of carbon bisulphid; Concerning the extract in wine;[1] Determination of phosphoric acid by titrating with molybdic acid;[2] Report on the results of fertilizer experiments conducted in Switzerland in 1885 and 1886; and Investigations of the Swiss barks used for tanning.[3]

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[1] Ber. deut. chem. Ges., 1880, p. 1171.

[2] Ibid., 1888, p. 2762.

[3] Mitt. Schweiz. Controlanstalt forst. Versuchsweseus, 1, No. 1.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

A digestion flask for obtaining the acid solution in soil analysis, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 248–251, figs. 2*).—Digestion in porcelain beakers as proposed by Hilgard is open to the objection that the acid partly evaporates and consequently varies somewhat in strength, and in using the stoppered bottles recommended by Kedzie "it is difficult to obtain bottles that will stand so high a pressure for so long a time, and it requires a very perfect-fitting stopper to prevent any interchange between the hot solutions in the water bath and the acid in the bottles."

"The flask [proposed by the author] has a capacity of 100 cc. The ground-glass stopper is provided with an exit tube that can be connected with a small glass tube or a condenser. . . .

"A compact form of condenser can be made from a galvanized iron pail by perforating the bottom with holes a little larger than the glass tubes that are to be inserted, and making the joints water-tight by means of rubber tubing. Long glass tubes can be used without any condensing apparatus. A cover is also provided for the water bath with small openings to allow the condensing tubes to pass through.

"The soil is weighed direct into these digestion flasks, and the proper amount of acid added. The flasks are then placed in the water bath and connected with the condensers. At the end of the fourth day the solution and insoluble residue is transferred to a casserole, and all of the remaining determinations are made in the usual way."

The results of comparisons of the three methods on soils of different character are reported.

"Under the same conditions the digestion flasks and the glass-stoppered bottles give practically the same results, with the advantage as to rapidity and less liability of losses in favor of the digestion flasks. Both of the methods give higher results for the potash and the alumina than the covered beaker. This is due to the action of the acid upon the soils at a more uniform temperature and maintaining the acid at its initial strength."

A new gasometric method for determining nitrogen in nitrates, F. GANTTER (*Ztschr. analyt. Chem., 34 (1895), No. 1, pp. 25–32, fig. 1*).—The method is based upon the facts that (1) nitrates are reduced to nitrites when heated in concentrated solution with phosphorous and sulphuric acids, and (2) when nitrite solutions are heated with ammonium chlorid the nitrogen of both the nitrite and the ammonium chlorid is set free, as shown by the following equations:

$$N_2O_5+P_2O_3=N_2O_3+P_2O_5.$$
$$N_2O_3+2NH_4Cl=2N_2+3H_2O+2HCl.$$

The method is conducted as follows: Three cubic centimeters of a solution which should contain not more than 300 mg. of nitrate with 500 mg. each of crystallized ammonium chlorid and crystallized phosphorous acid are placed in the digestion flask of a special form of gas generator which is described, and 2 cc. of sulphuric acid (2 parts of concentrated sulphuric acid and 1 of water) is added. The digestion flask is provided with a pipette in its mouth, in which 5 cc. of sulphuric acid (2 to 1) is placed, and is also connected with an absorption apparatus containing soda solution for purifying the nitrogen generated. This apparatus is placed in a cooling cylinder and the generating flask very slowly and carefully heated with the smallest possible flame. This soon produces a slow and uniform evolution of gas, which gradually increases, so that after a time the flame must be removed in order to check the too rapid generation of gas. The latter should be so regulated that the solution is not colored yellow, and when it has almost ceased the sulphuric acid in the pipette is allowed to run into the flask, which is warmed again and the solution gradually raised to the boiling point. This is continued until no further evolution of gas takes place, when the solution is strongly heated for a few minutes. This heating, however, must not be continued so long that the solution in the flask becomes colored by the concentration of the sulphuric acid. The nitrogen evolved is collected in a eudiometer over water and measured.

Accurate results were obtained by this method or modifications of it on nitrate of soda, nitrate of ammonia, nitrate of potash, nitrite of soda, and drinking water.

In applying the method to the examination of nitrate of soda 300 mg. each of phosphorous acid and ammonium chlorid instead of 500 mg. is used.

The method can be employed in the determination of very small amounts of nitric acid, and hence is applicable to the examination of drinking water. In this case the residue from the evaporation of 500 cc. of water is taken up in a little water and filtered into the digestion flask, in which the filtrate is evaporated nearly to dryness. To the residue 2 cc. of dilute sulphuric acid (2 to 1) and 100 mg. each of ammonium chlorid and phosphorous acid are added, and the operation conducted as above described.

On a new volumetric method for determining phosphoric acid in pure solutions, R. SEGALLE (*Ztschr. analyt. Chem., 34 (1895), No. 1, pp. 33–39*).—Various methods proposed for this purpose are briefly reviewed, and determinations by gravimetric analysis, volumetric analysis (using phenolphthalein as an indicator), by R. Maly's method[1] (original and modified), and by C. Glücksmann's method (as modified by J. Langer[2]) are reported.

The results are favorable to the Glücksmann method as compared with the others tested, and this method is recommended for adoption as a standard volumetric method, being especially valuable for pharmaceutical chemists.

Argon, a new constituent of the atmosphere, Lord RAYLEIGH and W. RAMSEY (*Chem. News, 71 (1895), No. 1836, pp. 51–63*).

The synthesis of albuminoid compounds, LILIENFELD (*Rev. Scientif., 1895, No. 3, p. 87*).—A notice of an article read before the Biological Society of Berlin.

A study of the vegetable alkaloids, E. ARMENDARIS (*Mem. Rev. Soc. Cient. "Antonio Alzate," 8 (1894–'95), No. 1 and 2, pp. 11–29*).—The method employed and the results obtained in a detailed study of these compounds are reported.

On the chemistry of chlorophylls, E. SCHUNCK and L. MARCHLEWSKI (*Liebig's Ann. Phys. und Chem., 284, No. 1 and 2, pp. 81–107*).—A second paper, the first being published in the same journal, vol. 278, p. 329.

On the determination of iron oxid and alumina in mineral phosphates, W. HESS (*Ztschr. angew. Chem., 1894, No. 22, pp. 679–683*).

On a new method of determining fat in milk, P. FERNANDEZ-KRUG and W. HAMPE (*Ztschr. angew. Chem., 1894, No. 22, pp. 683–687*).

Improved laboratory apparatus, J. VOLHARD (*Liebig's Ann. Phys. und Chem., 284, No. 1 and 2, pp. 233–244, figs. 5*).—The apparatus described include a water bath with constant level, oven for heating sealed tubes, and a gas furnace for elementary analysis.

Volumetric and colorimetric analysis, W. H. SYMONS (*Pharm. Jour. and Trans., 54 (1895), No. 1284, pp. 652–655, fig. 1*).

The scientific principles of analytical chemistry, W. OSTWALD (*Die wissenschaftlichen Grundlager der analytischen Chemie. Leipzig: W. Engelman, 1894*).—Reviewed in *Phil. Mag. and Jour. Sci., 39 (1895), No. 237, p. 225*.

Notes on the Grandeau method for humus, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 251–254*).—This is a reprint of an article first published in *Jour. Amer. Chem. Soc., 16 (1894), No. 3, pp. 210–213* (E. S. R., 5, p. 932).

Methods of determining sugar and starch, J. M. BARTLETT (*Maine Sta. Rpt. 1893, p. 37*).—A detailed description is given of the individual methods with acid and with diastase.

Agricultural chemical contributions, V. STEIN (*Tidsskr. Landökon, 12 (1894), pp. 857–867; 13 (1894), pp. 722–737*).—A summary of agricultural-chemical work performed for the Royal Danish Agricultural Society during 1894.

BOTANY.

Grasses of Tennessee, II, F. LAMSON-SCRIBNER (*Tennessee Sta. Bul., vol. VII, No. 1, pp. 141, figs. 187*).—Part I of the Grasses of Tennessee,[3] when issued, was intended as preliminary to the part here presented, but considerations led to a modification of this plan and the present bulletin is complete in itself, and, as the author says, "may be called a handbook of the grasses of Tennessee." Descriptions of all the genera and species known to occur within the State are given, and under the specific descriptions are added economic notes whenever they would be of value or interest. In the descriptions of the tribes and genera notes are given on their numerical abundance and geographical distribution throughout the world, from which their relative representation in the region covered by the bulletin may readily be seen. There are more than 200 species and varieties of introduced and indigenous grasses described, representing 65 genera of 11 tribes, and most of them are figured, some for the first time. The illustrations, which were especially prepared for this work, show the general habit of the plant, the inflorescence and dissections of the spikelets, the latter being drawn to a larger scale than those showing the entire plant. For nearly every genus of more than a single species an analytical key of species is given that will materially aid in the determination of specimens. A feature of the bulletin is the index and glossary in which every scientific name and technical term used is concisely defined, in addition to the usual references to figures and pages. The most widely known common name of each species is given, and the scientific nomenclature is not burdened with a list of synonyms that are valuable only to a specialist. The nomenclature followed is in the main that used in the manuals covering the same region. The bulletin, while containing only the grasses of Tennessee, will be valuable to most of the eastern and central part of the United States, the region covered by Gray's Manual, the edition of 1890 of that work containing less than a score of genera not included in this bulletin.

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[1] Ztschr. analyt. Chem., 15, p. 417.

[2] Pharm. Post., 27, pp. 369–371 (E. S. R. 6, p. 610).

[3] Tenn. Sta. Bul., vol. V, No. 2 (E. S. R., 4, p. 249).

Notes on maize, E. L. STURTEVANT (*Torrey Bul., 21 (1894), No. 12, pp. 503–523*).

Synopsis.—Notes are given on crossing of species, crossing of varieties, mummy corn, effect of climate on the growth, growing season required for corn, and the physiology of pop corn.

The author thinks from the data given that it is highly probable that cross-fertilization is very common, at least within each species, but that there is some resistance to hybridization; however, more data are required before claiming the demonstration of the generalization. Within varieties color variation is very common. Descriptions are given of 4 varieties of mummy corn, 3 of which are from Peru, the other from Chile. All belong to the species *Zea amylacea.* The author offers a few generalizations on the effect of climate on corn. He says the common belief that a northern climate increases earliness and decreases size is not borne out by his observations, and the idea that we must go North for seed is untenable except that in the North are found only varieties maturing within certain periods. He thinks earlier corn must be sought by finding earlier varieties, whether in the North or South. The author gives as an explanation of the phenomenon of corn popping the fact that hot water causes starch to become plastic. In the pop corn the starch lies within a very tough endosperm and the application of heat causes the starch to swell; the liberated steam bursting the grain, exposes the white fluffy mass of swollen starch. In the case of the nonpopping corns, the endosperm is too thin and only splits to liberate the steam. Aboriginal names are given for parched or variously prepared kinds of corn.

Pentosans in plants, G. DE CHALMOT (*Amer. Chem. Jour., 16 (1894), pp. 589–611*).—The author found from 80 to 90 per cent of furfurol-yielding compounds in barley sprouts germinating in darkness, and separated from them a pentosan which yielded pentose on inversion. His investigations indicated that these furfurol-yielding bodies belong to the nitrogen-free extract, and are not derived from the cellulose, as suggested by Cross and Bevan. It is claimed that the fact that cane sugar interferes with the phloroglucol reaction explains the failure of these investigators to find pentosans in barley sprouts grown in darkness.

The author found that the amount of pentosans increased in germinating corn with the advance of germination. The amount in peas first increased, then decreased. Both in corn and in peas the amount in the seeds proper decreased, and that in the stems and roots steadily increased during germination. The increase of pentosans in the stems and roots of peas (and clover) is, however, not nearly so pronounced as that in the stems and roots of corn.

The author holds that the pentosans in the roots and stems are not derived from the seeds, but are formed from other plant constituents.

The amount of pentosans in the germs is but slightly affected by the presence or absence of light during germination.

In connection with the discussion of this topic a table is given showing percentages of pentosans found in seeds by the author and others.

Extensive experiments showed that nitrates supplied to the germinating corn increased the amount of pentosans dissolved from the seed. At the same time the stems and roots were poorer in pentosans but richer in albuminoids, the influence of the nitrates in this respect being very pronounced.

It was also observed that the pentosans of pine wood increased during growth, a fact which is in accordance with results obtained with all other growing parts of plants.

The evidence supporting the author's hypothesis that pentosans are not the result of the processes of assimilation but are formed from hexoses is discussed in detail.

Influence of drying on the respiration of tubers, J. F. LUND (*Rev. gén. Bot., 6 (1894), No. 69, pp. 353–355*).—The author has investigated the tubers and fleshy roots of artichoke, onion, radish, potato, and carrot. It was found that specimens ripened and kept over winter decreased in their respiration with their decrease in weight due to desiccation. In the case of young tubers collected in April or May that were formed during the season there was a slight increase in their respiration following a slight loss of water.

A manual of orchidaceous plants (*Chelsea: Jas. Veitch & Sons, 2 vols., pts. 10*).

Notes on Antigua grasses, C. A. BARBER (*Suppl. Leeward Islands Gaz., 1894, No. 32, pp. 165–170*).—Popular notes are given on Guinea grass (*Panicum jumentorum*), *Andropogon caricosus*, Bermuda grass, *Andropogon saccharoides*, and *Sporobolus indicus*.

The philosophy of flower seasons and the phenological relations of the entomophilous flora and the anthophilous insect fauna, C. ROBERTSON (*Amer. Nat., 29 (1895), pp. 97–117, pls. 3*).

Sensitive movements of some flowering plants under colored screens, J. M. MACFARLANE (*Bot. Centbl., 61 (1895), No. 4, pp. 136–146; No. 5, pp. 177–184*).

Concerning heliotropism, W. ROTHERT (*Cohn's Beiträge Biol. Pflanzen, 7 (1894), No. 1; abs. in Bot. Ztg., 53 (1895), II, No. 2, pp. 17–25; also Bot. Centbl., 61 (1895), No. 4, pp. 159–166*).

The discussion concerning the function of the root tips, W. ROTHERT (*Flora, 79 (1894), pp. 179–218; abs. in Bot. Centbl., 61 (1895), No. 5, pp. 199–200*).—A critical review of the literature relating to the subject.

The thorns of plants, H. COUPIN (*Pop. Sci. Monthly, 46 (1895), No. 4, pp. 498–501*).

The continuity of protoplasm in plants, R. BEER (*Nat. Sci., 6 (1895), No. 36, pp. 108–111*).—A review of the theory of continuity of protoplasm and a short bibliography of some of the more important contributions to the subject.

Mold and other growths found in the seed cavities of apples, L. MOORES (*Amer. Micr. Jour., 16 (1895), No. 2, pp. 49–54, figs. 2*).—The author reports the common growth found in seed cavities to be internal hairs. A *Penicillium* sometimes gains access through large openings at pip end or more commonly through insect burrows.

The coloring of apples (*Gard. Chron., 17 (1895), ser. 3, pp. 177, 178*).—A controversial article on the relative importance of direct sunlight and soil constituents on the production of high colors.

FERMENTATION—BACTERIOLOGY.

The microörganisms of fermentation, A. JOERGENSEN, translated by P. FREUND (*Les Microrganismes de la fermentation. Paris: 1895, pp. 318, figs. 56*).—Reviewed in *Rev. Scientif., 10 (1895), No. 3, p. 83*.

Recent researches on pectase and pectic fermentation, G. BERTRAND and A. MALLÈVRE (*Compt. Rend., 120 (1895), No. 2, pp. 110–112*).

The bacteria of drinking water, especially of the Chemnitz water supply, O. E. R. ZIMMERMANN (*Zwölfter Ber. Naturw. Ges. Chemnitz, pp. 79–168, pls. 5*).

A simple apparatus for disinfecting with steam, L. VAILLARD and BESSON (*Ann. Inst. Pasteur, 8 (1894), No. 12, pp. 833–853, figs. 5*).

ZOÖLOGY.

Are all birds of prey injurious to the farmer? E. A. SMYTH, Jr. (*Virginia Sta. Bul. 38, pp. 23-39*).—This bulletin consists of notes on the feeding habits of the common hawks and owls of Virginia, with the results of the examination of numerous stomachs of each species. Much of the matter is compiled from "Hawks and Owls of the United States."[1] The following species are treated of, brief descriptions and notes on the habits being included: Marsh hawk, sharp-shinned hawk, Cooper's hawk, goshawk, red-tailed hawk, red-shouldered hawk, broad-winged hawk, rough-legged hawk, golden eagle, bald eagle, duck hawk, pigeon hawk, sparrow hawk, fishhawk, barn owl, long-eared owl, short-eared owl, barred owl, screech owl, and great horned owl. The positive economic benefit of many of these species is urged.

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[1] U. S. Dept. Agr., Division of Ornithology and Mammalogy Bul. 3 (E. S. R., 4, p. 852).

Two tables are appended, one giving a résumé of the lists of stomach contents for each species, and the other giving the percentages of poultry or game, mice, and insects found in the food.

The weasels, B. H. WARREN (*Pennsylvania Sta. Rpt. 1893, pp. 159–168, pls. 2*).—Descriptive notes on *Putorius erminea* and *P. vulgaris*, with notes on their habits. The change of color from brown in summer to white in winter is described at some length, and colored illustrations of each pelage are given. Their food is remarked upon, and their destructiveness to poultry and game especially noted. A table is included giving the condensed reports of 100 observers in regard to the food and habits of weasels.

The destruction of animals injurious to agriculture, J. DANYSZ (*Ann. Sci. Agron., 10 (1893), I, No. 3, pp. 410–491*).—A review of work on the destruction of rodents and insects by means of contagious diseases.

METEOROLOGY.

Winds injurious to vegetation and crops, G. E. CURTIS (*U. S. Dept. Agr., Weather Bureau Bul. 11, pt. 2, Rpt. Internat. Meteorolog. Congress, 1893, pt. 2, pp. 435–444*).—Destructive winds are placed in one of the following classes: (1) Violent winds; (2) cold winds; (3) hot desiccating winds.

In the United States the tornado, the derecho, and the West Indian hurricane are the most violent of the class of winds which destroy by their force alone, but as they occur only over limited areas, or at very long intervals, their aggregate damage to fruits and crops is much less than is caused by the winds which frequently accompany local thunderstorms, and by the severe gales which often prevail during the passage of intense general storms.

The region of greatest destruction by violent winds in the United States is the Great Plains region, from Illinois westward to the boundary of cultivation. The greatest destruction is effected when such winds prevail at a late stage of the ripening grain, when the heads are thrashed out by the beating winds.

There are two classes of injurious cold winds: (1) Mountain and valley winds; (2) anticyclonic winds, or northerly winds associated with and following cyclones. In the United States mountain and valley winds do not occur to any marked extent, but in part of Europe these winds are exceedingly injurious to the vine and other tender fruits. The second class of cold winds includes those called blizzards and northers in the United States, and the mistral and bora of southern Europe. The fruit orchard is the principal victim of these piercing blasts. These cold winds are the principal enemy of the tender peach and determine the limit of its successful cultivation. A remarkable example of their effect is to be found in the climatic history of Michigan, where a half century ago peach trees flourished and were rarely injured by the cold; but after the lumberman began his work of deforestation Dakota blizzards made greater and greater inroads into the State, the tender peach trees were killed along their path, and now the peach crop has nearly disappeared. From the same cause the attempt to grow peaches in northern Kansas has been largely abandoned.

The third class of winds injurious to agriculture are those characterized by intense heat and dryness.

The hot winds of the Plains occur over a vast agricultural area and in some seasons do incalculable damage to all crops, and especially to wheat and corn, which cover the greatest acreage. The area over which they prevail extends from Dakota to Texas; in occasional seasons they occur east of the ninety-fifth meridian, but their greatest frequency and severity is westward of that meridian to the boundaries of cultivation. An illustration of their destructiveness to agriculture may be drawn from the statistics of 10 Kansas counties in 1888, which showed a loss of 21,000,000 bu. of corn alone, due principally to hot winds.

Some of the results of an investigation of the hot winds of 1889 are here given: They are usually from the southwest, and occur most frequently in July and August. They generally continue for about three days. The typical hot wind sets in at 9 or 10 a. m. and continues until about 5 p. m. In 6 hot winds reported the temperature ranged from 100 to 109° F. The average humidity probably did not exceed 25 per cent. The force of the wind varied from a "moderate breeze" to a "strong wind;" in one case it ranged from a "high wind" to a "gale." No quantitative measures of the rate of evaporation were received, but the rate was doubtless very high.

In general hot winds do not materially affect the crops until by their evaporative effect they have drained the soil of its moisture. All circumstances that conduce to diminish evaporation are most potent factors in preserving a crop of corn or wheat through a trying period. Freedom from weeds, deep plowing, and frequent cultivation which breaks up the capillary ducts in the soil, a sandy rather than a clayey surface soil, a subsoil of hardpan which stores up the rain waters for the crops to draw upon in critical periods—these are some of the conditions which diminish the rate of evaporation and delay the beginning of the drought.

Similar in effect to the hot winds of the Plains are those of the Pacific Coast. These occur in the Sacramento and San Joaquin valleys of California and to some extent in portions of Oregon and Washington. In California these winds are northerly, and are often designated as the "desiccating north wind." The greatest injury is done when the north wind occurs in May and June, during the periods when the great

California wheat crop may receive incalculable damage. In Oregon, as in California, the hot winds are especially injurious in June. Mr. B. S. Pague, of the National and the Oregon Weather Service, states:

> "Three days of hot winds may reduce yields from 30 bu. per acre to wheat not fit even for hay. The character of the wind is abnormal dryness, varying in force from 6 to 15 miles per hour, and accompanied by temperatures of from 75 to 90° F. The dry wind continues during the night, abating some, while the temperature has its diurnal change."

The California fruit grower has been among the earliest to recognize the efficacy of timber belts as a protection against the damaging effect of wind, and around many of the citrus groves of southern California may now be seen rows of eucalyptus or other trees for wind protection.

The great western plains offer the greatest sphere for the operation of timber as wind-breaks, for this is the natural home of all the destructive winds.

Many attempts at tree planting on the western plains have met with poor success because they have been improperly conducted. The aridity of the climate requires that suitable varieties be selected and properly combined; that a sufficient mass of foliage be obtained to create favorable conditions of growth, and then that the trees should not be left to themselves, but should be as thoroughly cultivated as any crop of grain. Sufficient experience has now been attained to demonstrate that, when these conditions are observed, timber strips can be successfully grown in Kansas as far west as the one hundred and first meridian, or beyond the present boundaries of successful agriculture. The last report from the experimental station at Garden City, in western Kansas, states that the timber strips planted for wind-breaks have made a marvelous growth. These strips consist of four rows of black locusts bordering all sides of a 160-acre lot, and several rows of cottonwoods on one side of an 80-acre lot.

The protective effect of standing timber as an obstruction to the wind being recognized, it is important to know to what distance this protection is extended. The extent of the protective action of a vertical obstruction is accurately exemplified by the distance to which a snow bank extends on the leeward side of a fence. This is the width of the protected strip and we desire to know its ratio to the height of the obstruction. Mr. Barnard, of Pawnee County, Nebraska, and Judge Whiting, of Iowa, are authorities for stating that the protection amounts to 1 rod (16½ feet) on the ground to every foot in height of the protecting trees. Other writers give a somewhat less ratio for the distance of protection, but an average estimate is that a solid belt of trees creates a calm area on its leeward side which is, at the ground, from 11 to 16 times as wide as the height of the trees.

Observation also indicates that barriers and obstructions, like buildings and trees, diminished the general velocity of the surface wind beyond the limits of their immediate protective influence. These data, therefore, lead us to believe that if timber strips are planted at distances apart not greater than a half mile, or in other terms, if every 160-acre lot is surrounded by a belt of trees like that at Garden City, a very considerable protection will be afforded to the entire acreage.

If the plains of Kansas were cross-sectioned by such timber belts, platting the State into 160-acre lots, the blizzards and the hot winds that now possess an unobstructed passage would be stayed in their course, their blighting and desiccating effects would be largely diminished, and thereby a long step would be taken toward that climatic amelioration which alone is wanting to make a large part of the prairie a veritable garden spot.—O. L. FASSIG.

Variations in the character of the seasons, H. GAWTHROP (*Amer. Met. Jour., 11 (1895), No. 9, pp. 332–339*).—The author presents figures showing the course of temperature at Philadelphia from October, 1888, to October, 1893, which period he divides up into 44 courses averaging 42½ days each. As a substitute for his plan of averaging daily means in 30-day periods the courses which he now adopts are not restricted to any definite number of days; in fact, the longest of the 44 comprises 191 days, viz, from January 2, to July 12, 1890. After some very general remarks he concludes—

> "The primal cause for the variations in the character of our seasons must be traced back through all the effects of diurnal and seasonal insolation, and of the cyclonic storms in the lower atmosphere, where it is manifested to us, up to the ever-flowing westerly current above. . . .
>
> "The vast movement from west to east of the upper atmosphere in our middle latitudes, extending to a width of 2,000 miles and more, I would liken to a river with its swift current in the middle, gradually lessening in velocity at the sides and bottom, though there is one movement different from any river, and that is the oscillations north and south with the sun. . . . Like a river, however, it must have a persistence in its flow, because of the inertia of its great volume, and yet again, like a river, this inertia may be overcome, and the direction changed by obstacles or influences in its bed. A straight ditch through a meadow becomes a crooked creek, by reason of the inequalities the water meets in its flow, and the river in greater volume swings in longer stretches from bend to bend. This, then, is my thought, that the great atmospheric-river changes its course, southing at one time and northing at another, because of the influences it meets in passing over the surface of the earth."

Among the influences disturbing this upper current he enumerates the two great continents and the two great oceans of the world, the annual movement of the sun northward and southward, and the tropical cyclones. He concludes by an appeal for the exploration of the upper atmosphere.

[The exploration of the upper atmosphere is undoubtedly an important desideratum, but it may well be doubted whether there is a uniform westerly current at great altitudes doing the work that is imagined by Mr. Gawthrop.]—C. ABBE.

Rhythm in the weather, H. H. CLAYTON (*Amer. Met. Jour., 11 (1895), No. 10, pp. 376–380*).—"To most persons nothing seems more irregular and fitful than the weather. Yet I think there is good reason to believe that through all this seeming irregularity there runs a web of harmony and rhythm.

"The yearly and daily weather periods are well known, but these, I believe, are not the only regular periods to be found. A year ago I described two rhythmic periods in the weather, one of about 7¼ and the other of about 6⅙ days in length. To these I will now add two shorter periods, one of 5 days 10.8 hours, and the other of about 4 days 15 hours. The action of these on the atmosphere is usually in combination, but they independently vary in intensity, so that now one and now the other predominates and gives its especial characteristics to the weather changes."

Investigations of these periods in all parts of the world indicate unmistakably that they exist in every part both of the northern and southern hemispheres.

Observations on dates of maximum temperatures during May and June, 1894, are reported which show a close agreement of the observed dates with those indicated by the 5½ and 7¼ day periods.

"During the summer I computed a series of normal waves for each of the periods, and by taking the times of maxima and minima and the amplitude from observation, I found it possible to reproduce the observed temperature with great accuracy, and even to plot a curve for a week in advance which would represent the observed temperature or pressure very closely as long as the periods continued to run without a break. . . . The predicted and observed temperature followed almost exactly the same course; but what is most remarkable is the fact that the predicted minimum temperature and the observed minimum temperature was the lowest observed in August for more than 9 years.

"After I had made some progress in the investigation of these weather periods, an experiment was begun to ascertain how far they could be made useful in forecasting. Beginning with January 27, forecasts were published each week in a local newspaper. These forecasts consisted in stating which days were likely to be warmest and coldest, and on which rain or snow was most likely to fall. After 2 months these were verified, and it was found that of 17 days, mentioned as days on which rain was probable, rain fell on 12; while on the average for each 17 days not mentioned, rain fell on 5, indicating that the percentage of rain was twice as great on days when rain was forecasted as on other days. Two days were named each week as likely to be the warmest days. In 6 weeks out of 8 the warmest day of the week occurred on one of these. The coldest days were predicted in a similar manner, and in 4 cases out of 8 the coldest day of the week occurred on one of the days predicted. Since 2 days were included in each week, the chances were that 2 out of every 7, or 28 per cent might prove accidentally correct, while in reality 75 per cent of the warmest days were correctly predicted, and 50 per cent of the coldest.

"These facts appeared to indicate that the forecasts might prove of benefit to farmers and others, and accordingly on June 2 the issue of a weekly bulletin for general distribution was begun. These bulletins met with an encouraging support, and it was decided to continue them through the year. At the end of September, a verification of the forecasts was made, and it was found that out of 20 warm intervals predicted 13 averaged warmer than the mean of the week, and out of 19 cool intervals predicted 12 averaged cooler than the mean of the week, or about two-thirds in each case. A measurable quantity of rain fell on 33 per cent of the days on which rain was predicted, and on 20 per cent of the days on which no rain was predicted. Reports sent me from various stations indicate that this held substantially true for all of southern New England. The forecasts were made on Friday, and the success for the 5 days from Monday to Friday was about the same as for the other days.

"The excess in favor of the forecasts is not so great as I had at first hoped, but shows, as fully as it is possible to do, that the forecasts have a scientific basis, and are not merely the result of guesswork."

The difficulties which have been found to impair the accuracy of forecasting by this method are interference of the weather waves, by which one series is destroyed or its phase reversed, and two sets of storms, during October, one coming over New England from the lakes, the other from the South.

"The results were too intricate for my analysis, and produced a series of disheartening failures in the forecasts.

"Difficulties are to be expected in a new enterprise, but I am confident that they will be solved, one by one, until an exact science of the weather is constructed." The measure of success already attained is held to be "substantial evidence that the right clue to long-range weather forecasting has been found and will some day be perfected."

The moon and rainfall, H. A. HAZEN (*Amer. Met. Jour., 11 (1895), No. 10, pp. 373–375*).—Investigations made by the author at New Haven in 1880 showed "that nearly one-half more precipitation occurred at the time of new than of full moon." A study of the records for one hundred years at London yielded negative results, as did that of the rainfall of the whole country. The latter indicated "that the influence, if there were one, must be looked for in a rather circumscribed region."

The present paper records a study of the rainfall of New York City, New Haven, Connecticut, and Boston, Massachusetts, arranged according to each lunation, 296 lunations in 3 groups being represented.

"While both New York and New Haven show an increase at the time of new moon, yet the figures at Boston show a very remarkable maximum at the day of new moon, and an equally remarkable minimum on the seventeenth day of the lunation, or two days after full moon. I do not set forth these figures as an absolute proof that the moon does influence rainfall in the neighborhood of Boston, but it looks as though there must be something in it. There are at times remarkable reversals in the curves whereby a minimum point in one curve coincides with a maximum in the next, but to offset these there are remarkable coincidences; for example, a marked maximum at the twentieth day of the lunation throughout. It will require a good many more observations to prove anything one way or the other, but it would seem as though the curve at Boston could not be very materially modified with less than fifty years' observations."

Meteorological observations at Massachusetts Hatch Station, C. D. WARNER and F. L. WARREN (*Massachusetts Hatch Sta. Met. Bul. 72, pp. 5*).—Daily and monthly summaries of observations during December, 1894, and a general summary for the year. The annual summary is as follows: *Pressure* (inches).—Actual maximum, 30.47, January 17, 10 p. m.; actual minimum, 28.59, January 30, 6 a. m.; mean reduced to sea level, 30.085; annual range, 1.88. *Temperature*[1] (degrees F.).—Maximum, 97, 98, July 20; minimum, —9, —17, February 25; mean, 49.7, 47.9; annual range, 106, 115; maximum mean daily, 82.5, 84, July

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[1] The first figures denote reading at top of tower (51 ft. above the ground), the second at base.

28; minimum mean daily, 1, —1.5, February 24; mean maximum, 57.7, 59.6; mean minimum, 38, 36.9; mean daily range, 16.5, 22.7; maximum daily range, 35, May 12, 47.5, February 17; minimum daily range, 2, 5, October 25. *Humidity.*—Mean dew point, 40.5; mean force of vapor, 0.4416; mean relative humidity, 71.9. *Precipitation.*—Total rainfall or melted snow, 32.64 in.; number of days on which 0.01 in. of rain or melted snow fell, 125; total snowfall, 71½ in. *Weather.*—Mean cloudiness observed, 50.5 per cent; total cloudiness recorded by the sun thermometer, 2,488 hours, or 54.9 per cent; number of clear days, 107; number of fair days, 83; number of cloudy days, 175. *Wind.*—Direction, SW., 17 per cent; S., 15 per cent; N., 15 per cent; NW., 13 per cent; total movement, 36,257 miles; maximum daily movement, 443 miles, April 13; minimum daily movement, 0 miles, September 29; mean daily movement, 99.4; mean hourly velocity, 4.1 miles; maximum pressure per square foot, 22½ lbs. = 67 miles per hour, February 23, 2 p. m. *Bright sunshine.*—Number of hours recorded, 2,051. *Mean ozone*, 24.9 per cent. *Dates of frost.*—Last, May 22; first, August 22. *Dates of snow.*—Last, April 12; first, November 5.

Meteorological observations at Pennsylvania Station, W. FREAR and W. S. SWEETSER (*Pennsylvania Sta. Rpt. 1893, pp. 169–173, 182–188, 193–222*).—The meteorological work of the station in 1893 was "chiefly a continuation of the work of the preceding years, including observations of the kind usually made by the United States Weather Service upon atmospheric phenomena, and also observations upon soil temperatures at various depths and upon the amount of sunshine" (E. S. R., 6, p. 115). Monthly summaries of observations and weekly crop reports are given in the body of the report and the detailed daily record in an appendix. The annual summary is as follows:

Summary of meteorological observations, 1893.

	Year 1893.	Growing season (Apr. to Sept., 1893).
Barometer (inches):		
Mean	29. 905	
Highest	30. 857 (Feb. 5)	
Lowest	29. 113 (Oct. 14)	
Temperature (° F.):		
Mean	47. 6	62.
Highest	92 (June 20, Aug. 11)	92 (June 20, Aug. 11).
Lowest	—7 (Jan. 18)	29 (Apr. 11).
Annual range	99	21. 1.
Mean daily range	19. 1	43 (Aug. 5, Sept. 5).
Greatest daily range	43 (Aug. 5, Sept. 5)	
Least daily range	3 (Jan. 28, Mar. 23)	
Mean daily relative humidity (per cent)	78. 2	72. 95.
Rainfall (inches):		
Total	42. 2	24. 99.
Greatest monthly	64. 6 (May)	
Greatest daily	1. 6 (Aug. 29)	1. 60 (Aug. 29).
Number of days on which 0.01 in. or more of rain fell.	135	69.
Mean percentage of cloudiness	60. 95	55. 8.
Number of days on which cloudiness averaged 80 per cent or more.	152	66.
Average hours of sunshine per day		5 h. 56 min.
Wind (miles):		
Total movement	32, 700	
Maximum velocity	40 (Feb. 19)	
Greatest daily movement	425 (May 4)	
Last frost in spring		May 8.
First frost in fall		Sept. 27.

Principal periods of crop development.

Wheat:
- Sown September 5-12, 1892.
- In bloom June 9, 1893.
- Ripening June 23.
- Harvested July 14-21.

Corn:
- Planted May 19.
- In silk August 4.
- Cut September 8 to October 6.
- Husking began October 6.

Oats:
- Sown April 24.
- Ripening July 28.
- Harvested August 4.

Potatoes:
- Planted May 19.
- Harvested (late varieties) September 8 to 29.

Grass:
- In bloom June 23.
- Hay cut June 30 to July 14.

Clover:
- Cut June 23.
- Second crop in bloom August 4.

"The weather in general pleasant, but marked departure from the average. For the year as a whole, the minimum temperature was somewhat below the usual figure, and the mean daily range a trifle high. The total rainfall was somewhat above the average, as was the cloudiness. For the winter season of 1892-'93 the mean temperature was low; while the snowfall was heavy, especially in February, the winter was dry and cisterns were emptied. During the growing season of 1893 the mean daily range of atmospheric temperature was a trifle above the average, but that of the soil further below the average. The rainfall was not excessive, and was fairly distributed; coming at haying and at spring plowing time, it retarded farm operations, while there was some drought in midsummer. In general, the year was cloudy. The hay crop was moderate, wheat good, oats a little light, and corn considerably below the average, it having suffered from summer drought. In spite of late planting, it matured fully as early as usual."

The distribution of storms on the surface of the globe (*Rev. Scientif., 10 (1895), No. 3, pp. 92, 93*).

The cause of the cyclones of the temperate latitudes, W. H. Dines (*Amer. Met. Jour., 11 (1895), No. 10, pp. 359-364*).—A discussion of Ferrel's convection theory and Hann's eddy theory, the weight of evidence being stated to be in favor of the former.

Recent foreign studies of thunderstorms, R. DeC. Ward (*Amer. Met. Jour., 11 (1895), No. 10, pp. 364-368*).—A brief review of recent reports of investigations of this subject in Russia.

Psychrometer studies, H. A. Hazen (*Amer. Met. Jour., 11 (1895), No. 10, pp. 371-373*).—A criticism of Ekholm's methods and results in this line.

Gulf storm notes, W. D. Stearns (*Amer. Met. Jour., 11 (1895), No. 10, pp. 368-371*).—Notes taken during the passage of the Gulf storm of October 4 to 11, 1894.

Meteorological summary for North Carolina for November, 1894, H. B. Battle, C. F. von Herrmann, and R. Nunn (*North Carolina Sta. Weather Service Bul. 62, pp. 171-183, charts 2*).—The usual summaries of observations by the State Weather Service coöperating with the Weather Bureau of this Department.

Mexican meteorological bibliography, R. Aguilar y Santillán (*Mem. Rev. Soc. Cient. "Antonio Alzate," 8 (1894-'95), No. 1 and 2, pp. 5-9*).—This is for the year 1893, uniform with similar bibliographies for preceding years by the same author, published in previous volumes of this journal.

Observations on dew and frost, R. Russell (*Naturwiss. Rundschau, 1893, No. 19, pp. 235-239; abs. in Centbl. agr. Chem., 23 (1894), No. 10, p. 697*).—The author reports independent observations which confirm the conclusions of a number of other investigators that dew and frost are largely produced by the aqueous vapor arising from the earth, and that the aqueous exhalations of plants also contribute to dew formation.

SOILS.

On the movement of water in the soil, MOORMANN (*Schilling's Jour. für Gasbeleuchtung und Wasserversorgung, 1894; abs. in Forsch. Geb. agr. Phys., 17 (1894), No. 5, pp. 449, 450*).—The principal point brought out in this paper is that in all soils water forms hydrates (termed by Graham and Mendelejeff hydrosols) which more or less completely fill up the soil pores and interfere with the circulation of water.

The fact that wet sand molded by the hand retains its shape after drying is an evidence that the water has developed a binding power which the sand did not previously possess. This can be explained in case of pure sand, it is claimed, only by the formation of a thin coating of hydrate of silica which binds the particles together. The finer the sand the greater the amount of this hydrate formed.

While this formation of hydrates in sand lessens the friction between particles and causes them to occupy less space, in case of close-grained dry clay it is so great that the clay increases in volume almost 15 per cent in absorbing the ordinary amount of soil moisture.

In support of the theory that water combines chemically with clay soils it is pointed out that moderately moist clay yields no water on pressure, and that moistening of clay generates an appreciable amount of heat and develops a peculiar odor, at the same time evolving gases. The influence that this formation of hydrates has on the circulation of the water of the soil depends, of course, upon the fineness of the soil particles and the amount of hydrates formed.

Soil temperatures, W. FREAR and W. S. SWEETSER (*Pennsylvania Sta. Rpt. 1893, pp. 174–181, 187, 223–246*).—A record is given of tri-daily observations during 1893 with thermometers at the surface and at depths of from 1 to 24 in.

The following is a summary of observations during the growing season:

Soil temperatures, April to September, 1893.

Depth.	Highest.	Lowest.	Daily mean.	Mean daily range.	Greatest daily range.
	Deg. F.	*Deg. F.*	*Deg. F.*	*Deg. F.*	*Deg. F.*
At surface	81.0 (June 20, July 4, Aug. 11).	33.0 (Apr. 2)	61.3	8.99	24.0 (Apr. 3, 8).
1 in. deep	81.0 (Aug. 11)	32.0 (Apr. 2)	60.4	8.44	23.5 (Apr. 8).
3 in. deep	76.5 (Aug. 11)	32.0 (Apr. 2, 3)	60.9	4.27	17.0 (May 30).
6 in. deep	76.0 (Aug. 11)	32.0 (Apr. 1, 2, 3)	60.1	2.86	9.5 (Apr. 8).
12 in. deep	73.0 (Aug. 11)	32.5 (Apr. 1, 5)	60.0	1.13	4.5 (Apr. 8).
24 in. deep	69.5 (Aug. 28, 29)	33.0 (Apr. 1–4)	58.5	0.25	1.5 (May 8, Sept. 12).

Analyses of soils, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 254–258*).—Analyses of 17 samples in addition to those reported in Bulletin 30 of the station (E. S. R., 5, p. 857) are tabulated and briefly discussed.

"Most of these soils have been under cultivation from 5 to 30 years.

"The first impression of the results would indicate that the weak point is in the potash content. . . . In many of these soils the total potash amounts to as much as 2.5 per cent, while the amount of potash soluble in acid amounts to only a little over 0.20 per cent. There is every indication . . . that much of the potash that is insoluble in the acid possesses agricultural value. . . .

"These analyses, as well as those reported in former publications, show that most of the typical soils of the State are well supplied with phosphoric acid. . . .

"There is a good content of lime in most of the typical soils of the State."

The action of organic and mineral acids upon soils, H. SNYDER (*Jour. Amer. Chem. Soc., 17 (1895), No. 2, pp. 148–151*).—Comparative tests of the solvent action of hydrochloric acid of 1.115 sp. gr.; 10 per cent solutions of citric, oxalic, and tartaric acids; and a 10 per cent mixture of the last three, were made on the same sample of soil. The digestion was carried on for 36 hours in the Snyder soil flask (see p. 689). The results obtained were as follows:

Solvent action of hydrochloric and organic acids upon soil.

	Hydrochloric acid 1.115 sp. gr.	Ten per cent solution of—			
		Citric acid.	Oxalic acid.	Tartaric acid	Organic acid mixture.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Total insoluble matter	84.08	87.90	85.07	87.67	85.93
Potash	0.30	0.12	0.18	0.06	0.10
Soda	0.25	0.17	0.19	0.05	0.12
Lime	0.51	0.50	0.23	0.41	0.45
Magnesia	0.26	0.27	0.21	0.32	0.33
Iron oxid	2.56	1.59	1.14	1.62	2.23
Alumina	4.24	1.45	3.96	1.77	2.99
Phosphoric anhydrid	0.23	0.26	0.14	0.11	0.26
Sulphuric anhydrid	0.08	0.10	0.05	0.06	0.05

"The oxalic acid possesses the greatest solvent action upon the complex insoluble matter of an alkaline nature. The citric acid possesses the greatest solvent action upon the lime, magnesia, and the sulphuric and phosphoric anhydrids. The amount of lime dissolved by the oxalic acid is greater than would at first be expected, but the complex nature of the solution and the presence of the salts of other metals has caused nearly half as much lime to be dissolved by the oxalic acid as by the hydrochloric acid of 1.115 sp. gr.

"The 10 per cent mixture of the 3 organic acids has resulted in dissolving as much phosphates and magnesia and nearly as much lime as any one of the acids acting alone. The potash does not appear to be as soluble in the organic acid mixture as the other elements of plant food.

"The amount of potassium, iron, and aluminum oxids dissolved by these 3 organic acids and their mixtures is somewhat less than that dissolved by the hydrochloric acid. . . . The main difference between the solvent action of the hydrochloric and the organic acids is in the somewhat smaller amount of potash dissolved by the organic acids.

"With the exception of the solubility of the potash, as noted, these results bring out in a general manner the value of hydrochloric acid of 1.115 sp. gr. as a solvent over the organic acids of 10 per cent strength, because the hydrochloric acid represents the limit of the solvent action reached by any one of the organic acids acting alone or in a mixture."

The solvent action of concentrated mineral acids, hydrochloric, nitric, and sulphuric, was tested on the same sample of soil and compared with the results obtained by the fusion method.

"Concentrated hydrochloric acid, 40 per cent strength, dissolved 2¼ per cent more of the complex silicates than nitric acid of the same strength. Concentrated nitric acid possesses a stronger solvent action than the dilute hydrochloric acid. The concentrated hydrochloric acid dissolved somewhat more potash than the hydrochloric acid of 1.115 sp. gr. The amount of lime, phosphates, and sulphates dissolved by the concentrated hydrochloric acid was about the same as when the more dilute acid was used; the concentrated acid, however, dissolved more of the complex silicates of potash, iron, and alumina. Sulphuric acid possesses the strongest solvent action.

"Of the total potash in the soil as determined by fusion, less than 18 per cent is soluble in the hydrochloric acid as used in soil analysis; about 10 per cent is soluble in oxalic acid, and 3 per cent in tartaric acid."

The chemical analysis of the soil in its relation to fertilizer experiments, VON LIEBENBERG and E. VON PROSKOWETZ, Jr. (*Mitt. Ver. Förd. landw. Versuchw. Oesterr., 1894, No. 9, pt. 1, pp. 23–35*).—As in the two previous years (E. S. R., 5, p. 702), the soil of plats containing 100 square meters on which fertilizer experiments on barley and oats were made was carefully sampled and analyzed and the results of analysis compared with the action of the fertilizers employed. In previous analyses only the phosphoric acid and nitrogen were determined, while in the present case potash soluble in nitric acid was also estimated. The results in general confirm those of previous investigations. Nitrogen was found to be as a rule more abundant in the soil than in the subsoil. The relation of phosphoric acid in the soil and subsoil was variable, being influenced evidently by the previous system of culture and manuring. The same was true in general of the potash. In the heavy soils used the potash was in almost every case considerably higher than the phosphoric acid and frequently higher than the lime. The soils are therefore much benefited by calcareous manures.

The experiments with barley indicated that in unfertilized soil the yield varied directly with the amount of nitrogen present. As in previous years, the yield was greater the greater the proportion of nitrogen to phosphoric acid, provided a sufficient amount of phosphoric acid and potash was present. The ratio of phosphoric acid to nitrogen in the first series of soils was 1 to 1.38, in the second series 1 to 1.06. In almost every case the soils responded to applications of nitrate of soda, although the soils contained amounts of nitrogen varying from 17 to 84 kg. per 100 square meters of soil.

With phosphatic fertilizers the results were irregular, but as a rule they were effective on barley on soils containing an average of 24.5 kg. of phosphoric acid in 100 square meters of the surface soil, and on oats on soils containing an average of 23.4 kg. It is concluded that on soils containing more than about 40 kg. of phosphoric acid per 100 square meters of surface soil manuring with phosphates is of doubtful value or entirely useless for cereals, unless accompanied by heavy applications of nitrogenous fertilizers. This limit of profitable application of phosphatic manures will be exceeded or fallen short of according to the availability of the phosphoric acid of the soil, the season, etc.

The season was such and the number of experiments with potash so small that no definite conclusions as to the limit of profitable potash fertilizing can be drawn, but it is shown with considerable certainty that the limit is considerably higher than with phosphatic manures. It appears also that for cereals soils must contain more lime than potash in order that potash fertilizing may be profitable.

Conservation of moisture in the soil, S. B. GREEN (*Minnesota Sta. Rpt. 1893, pp. 232–238*).—Reprinted from Bulletin 32 of the station (E. S. R., 6, p. 21).

Nitrification, J. R. HARRIS (*Jour. Elisha Mitchell Sci. Soc., 11 (1894), No. 1, pp. 16–25*).—A résumé.

The conservation of nitrates in the soil (*Jour. Agr. Prat., 59 (1895), No. 4, pp. 144, 145*).—A brief summary of Dehérain's results.

The available plant food in soils (*Jour. Bath and West of England Soc., 4 (1893–'94), ser. 4, pp. 212–215*).—A brief review of an article by B. Dyer on this subject.[1]

The composition of native and cultivated soils and the effects of continuous cultivation upon their fertility, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 163–191*).—A reprint of Bulletin 30 of the station (E. S. R., 5, p. 857), with the addition of brief notes on the collecting and forwarding of soil samples.

The management of clay farms, W. F. BROWN (*Cult. and Country Gent., 70 (1895), No. 2195, pp. 143, 144*).—Notes on cultivation on clay land in Ohio, with advice as to its proper treatment.

FERTILIZERS.

Analyses and valuation of complete fertilizers, ground bone, and miscellaneous samples, E. B. VOORHEES, L. A. VOORHEES, and J. P. STREET (*New Jersey Stas. Bul. 104, pp. 46*).—This is the second of the two regular annual bulletins on fertilizers issued by the station. The main object of the first (Bul. 102; E. S. R., 6, p. 396) was "to show the sources and composition of the materials containing the best forms of nitrogen, phosphoric acid, and potash; the cost per pound of the ingredients; and the advantages of making home mixtures." The present bulletin gives analyses and valuation of 224 samples of mixed fertilizers, 29 samples of bone, 9 samples of wood ashes, and 17 samples of miscellaneous products, the main object being "to show whether the actual composition of the various products corresponds with their guaranty as required by law."

As a rule the fertilizers examined contained as much total plant food as was guaranteed, but in many cases "it was not distributed in the proportions stated in the guaranties, which indicate either a lack of skill or of carefulness in their preparation. In two cases only the consumer received less of all of the plant-food constituents than was guaranteed."

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[1] Jour. Chem. Soc. London, 1894, Mar., p. 115 (E. S. R., 5, p. 1013).

"Ninety-six of the 224 brands, or 43 per cent, contained less phosphoric acid than was guaranteed; 27 brands contained less potash, and 20 less nitrogen. In the case of nitrogen particularly, the actual amount contained was in many cases greatly in excess of the guaranty.

"The chief difficulty in respect to keeping the guaranty was in the case of phosphoric acid.

"The average composition, selling price, and commercial valuation per ton of all the brands of mixed fertilizers examined in 1891, 1892, 1893, and 1894, as well as the percentage difference between valuation and selling price, or the charges for mixing, bagging, and selling, are shown in the following tabulation:

Average composition, selling price, and valuation of fertilizers.

	Total nitrogen.	Total phos. acid.	Available phos. acid.	Insoluble phos. acid.	Potash.	Selling price.	Station valuation.	Percentage difference.
1891	2.71	10.12	7.29	2.83	4.21	$34.23	$25.31	35.2
1892	2.74	10.38	7.70	2.67	4.50	34.19	25.66	33.2
1893	2.69	10.23	7.54	2.69	4.58	34.11	24.41	39.7
1894	2.87	10.40	7.37	3.03	4.94	34.17	24.83	37.6

"At the average cost per pound of the nitrogen, phosphoric acid, and potash in these fertilizers it would cost the farmer 36 cts. to return to the soil the fertilizing ingredients carried off in every bushel of wheat sold, 28 cts. to return the amount contained in a bushel of corn, 30 cts. to return that contained in a bushel of rye, 18 cts. for that contained in a bushel of oats, and $7.16 to return the fertilizer constituents removed in a ton of timothy hay. . . .

"It is clear that at these prices for plant food a very narrow margin is left to the farmer in the sale of crops for legitimate charges for labor of growing, hauling, selling, and other expenses."

Still it is maintained that the use of fertilizers is profitable, even under these conditions. It is recommended, however, to (1) reduce cost of plant food in mixed fertilizers by buying on the "unit"[1] basis; (2) limit exportation of fertilizing constituents from farms on which stock is kept "by a judicious exchange of grain and hay for concentrated feeds rich in the fertilizing constituents, coupled with careful saving and intelligent application of the manure made;" and (3) reduce the outlay for the expensive element nitrogen "by sowing larger areas of leguminous crops which gather nitrogen from the air." Crimson clover is considered especially valuable for this purpose.

"The samples of ground bone examined this year, on the whole, reached their guaranty, showed a good degree of fineness, and, with few exceptions, a relatively high valuation. A larger number than usual, however, belonged to the class 'steamed bone.' . . .

"The number of samples of wood ashes examined this year was somewhat larger than usual, and they showed the usual wide variation in composition. . . . With but one or two exceptions the prices charged for the plant-food constituents were excessive."

Fertilizing with phosphoric acid as a means of producing cheap nitrogen, P. WAGNER (*Deut. landw. Presse, 22* (*1895*), *No. 1, pp. 5, 6, figs. 3*).—Pot experiments with fertilizers on oats, peas, and vetches are reported, illustrating especially the difference in the relation of leguminous plants and cereals toward nitrogen. It appears from these experiments that potash and phosphoric acid were without effect on oats except when used in connection with nitrogen. On the other hand, they exerted their full effect on the peas and vetches without the addition of nitrogen. The yields on the pots under different methods of fertilizing were as follows:

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[1] One per cent per ton or 20 lbs.

Yields of oats, peas, and vetches with different fertilizers.

	Without nitrogen.			With nitrogen.		
	Oats.	Peas.	Vetches.	Oats.	Peas.	Vetches.
	Grams.	*Grams.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
With potash and phosphoric acid	29	317	287	415	376	332
Without potash and phosphoric acid	32	131	85	126	159	126
Increase due to potash and phosphoric acid	−3	186	202	289	217	206

The oats grown on the unfertilized soil and on the soil fertilized only with potash and phosphoric acid contained on the average 0.23 gm. of nitrogen per pot; while the peas grown on the unfertilized pot contained 2.02 gm. of nitrogen, and on the pot fertilized with potash and phosphoric acid 6.11 gm. of nitrogen. The results plainly show that potash and phosphoric acid were without effect on cereals except when a supply of soluble nitrogen was present in the soil or was furnished in the fertilizer, but that they were effective on leguminous plants when the nitrogen was deficient, because these plants assimilate the nitrogen of the air.

From these experiments it appears that for each 100 kg. of phosphoric acid which the soil or the fertilizer furnishes to vetches 400 kg. of atmospheric nitrogen is collected and stored up in the plant tissue; while for each 100 kg. of phosphoric acid furnished to oats 250 kg. of nitrogen is drawn from the soil or the fertilizer applied.

In order that leguminous plants may collect the maximum amount of nitrogen from the air they must be liberally fertilized with phosphoric acid (and, where necessary, with potash). This should be applied when the stubble is turned down and the leguminous crop seeded, or if the latter is seeded among the grain sufficient phospate should be applied to supply the needs of both crops. In no case should the leguminous crop be allowed to hunger for phosphoric acid. The quicker its needs in this respect are supplied the sooner and more rapidly it will collect nitrogen from the air.

The results of investigations of the cause of failures of alfalfa in certain fields of Laubenheim, on the Rhine, are cited as indicating that decline in thriftiness of leguminous plants on soils on which they have been grown continuously for several years may be due to exhaustion of the soil in available phosphoric acid.

Investigations on the foraging powers of some agricultural plants for phosphoric acid, W. BALENTINE (*Maine Sta. Rpt. 1893, pp. 13–25, pls. 21*).—The comparative capacity of wheat, barley, corn, beans, peas, potatoes, and turnips to utilize the phosphoric acid of insoluble phosphates (South Carolina rock) was tested as follows: For each kind of plant 9 wooden boxes 15 in. square and 12 in. deep, containing 120 lbs. of fine sand,[1] were used in 3 sets of 3 boxes each, fertilized as follows: Set I, 8.5 gm. nitrate of soda (1.36 gm. nitrogen), 2.6 gm. muriate of potash (1.36 gm. potash); Set II, 8.5 gm. nitrate of soda (1.36 gm. nitrogen), 2.6 gm. muriate of potash (1.36 gm. potash), 17 gm. South Carolina rock (3.96 gm. insoluble phosphoric acid and 0.39 gm. citrate soluble phosphoric acid); Set III, 8.5 gm. nitrate of soda (1.36 gm. nitrogen), 2.6 gm. muriate of potash (1.36 gm. potash), 28.5 gm. acidulated South Carolina rock (3.34 gm. soluble phosphoric acid, 0.50 citrate soluble phosphoric acid, and 0.62 gm. insoluble phosphoric acid).

The boxes were given proper care, and the crops were harvested at maturity; photographs, from which the plates in the article were made, being taken just before harvesting. The yields obtained were as follows:

Yields of dry matter by different crops.

	Yield of dry matter.		
	Set I.—No phosphate.	Set II.—Insoluble phosphate.	Set III.—Soluble phosphate.
	Grams.	*Grams.*	*Grams.*
Wheat	76.9	148.6	296.3
Barley	201.5	294.9	508.1
Corn	39.5	103.3	291.0
Beans	15.7	17.4	69.8
Peas	112.7	196.7	228.6
Potatoes	113.3	114.6	223.6
Turnips	154.4	304.1	270.4

"While it may not be desirable to draw definite conclusions from so small an amount of data as is furnished by the above-described experiments, there are some points which under the conditions of these experiments the results appear to bring out sharply.

"(1) Different crops showed a decided difference in their powers of obtaining phosphoric acid from crude, finely ground South Carolina rock. Wheat, barley, corn, peas, and turnips apparently appropriated the insoluble phosphoric acid from this source with greater or less ease, while beans and potatoes derived no benefit from it.

"(2) The greatest practical advantage derived from the use of finely ground South Carolina rock was with the turnips. With this crop a larger weight of dry matter and also a larger weight of fresh roots was obtained with insoluble phosphoric acid from the finely ground South Carolina rock than with an equal amount of soluble phosphoric acid from acidulated South Carolina rock.

"(3) The indications point to a profitable use of finely ground South Carolina rock as a manure for barley and peas as well as turnips."

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[1] Containing 0.096 per cent of potash and 0.012 per cent of phosphoric acid.

It was incidentally observed in these experiments that "the acidulated South Carolina rock apparently depressed the yield of grain with barley while largely increasing the amount of straw; with wheat both grain and straw were largely increased and in about the same proportion." The figures obtained were as follows:

Effect of acid phosphate on proportion of grain and straw of wheat and barley.

	Set I.	Set II.	Set III.
	Grams.	*Grams.*	*Grams.*
Barley (air dry):			
Total crop	215	312	538
Grain	44	61	17
Wheat (air dry):			
Total crop	84	162	325
Grain	26	50	105

A partial chemical analysis (fertilizing constituents) is given of the total crop produced in each set of boxes.

Results of five years' experiments with fertilizers, W. C. STUBBS (*Louisiana Stas. Bul. 31, 2d ser., pp. 1092–1123*).—After an introduction discussing the forms of fertilizers used with a brief review of the latest investigations relating to the nature, care, and use of barnyard manure, and remarks on the value of leguminous plants in rotation, deductions drawn from five years' experiments with fertilizers for staple crops on three typical soils of the State are reported. The fertilizers which at one time or another have entered into these experiments are: *Nitrogenous fertilizers*—Stable and farm manures, composts with and without cotton seed and with and without acid phosphate, cotton seed (raw, crushed, and rolled), cotton seed meal, nitrate of soda, sulphate of ammonia, dried blood, fish scrap, and tankage; *Phosphatic fertilizers*—Dissolved boneblack, acid phosphate, precipitated dissolved bone, precipitated acid phosphate, bone meal, bone ash, floats, and iron slag; *Potassic fertilizers*—Kainit, muriate of potash, sulphate of potash, nitrate of potash, carbonate of potash, and cotton-hull ashes.

The chemical composition of the soils experimented on was as follows:

Composition of Louisiana soils.

	Audubon Park.		Baton Rouge.				Calhoun.	
	Light soil.	Dark soil.	Bluff soil.	Bluff subsoil.	White soil.	White subsoil.	Front field.	Rear field.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Water	13.230	14.460	1.540	0.874	2.3800	3.320	....	....
Sand and insoluble matter	70.100	62.050	90.650	89.790	87.7200	83.000	97.010	95.510
Soluble silica	....	....	0.133	0.043	0.0784	0.097	0.120	0.090
Potash	0.440	0.180	0.100	0.164	0.1200	0.180	0.023	0.029
Soda	0.120	0.750	0.078	0.054	0.0760	0.123	0.029	0.058
Lime	0.790	0.910	0.170	0.163	0.0600	0.120	0.085	0.145
Magnesia	0.810	1.360	0.114	0.160	0.0210	0.085	0.018	0.074
Ferric oxid	11.280	13.440	4.225	6.510	6.6700	8.880	0.336	0.529
Alumina							0.762	0.829
Phosphoric acid	0.160	0.150	0.064	0.128	0.1120	0.106	0.037	0.048
Sulphuric acid	0.020	0.030	0.036	0.025	0.0210	0.016	Trace.	Trace.
Organic matter	3.160	6.650	3.150	2.741	2.8200	4.210	1.575	2.225
Nitrogen	0.112	0.085	....	....	....	....	0.025	0.037

The soil at Audubon Park is alluvial, very stiff, and is benefited by thorough drainage. "It is an excellent quality of 'mixed' soil." That at Baton Rouge is a brown loam belonging geologically to the Bluff formation. It is underlaid at varying depths by white chalky-looking clay. It is greatly benefited by drainage, but this is difficult to obtain on account of the conformation of the land. The Calhoun soils vary from yellow sandy clays to pure sand. "They are naturally very poor, but susceptible of rapid improvement and responsive to the smallest application of manures."

Experiments were made to determine the kind, form, and quantity of each of the fertilizing constituents required by sugar cane, corn, oats, and cotton at Audubon Park; cotton, corn, sugar cane, and potatoes at Baton Rouge; and cotton, corn, sugar cane, tobacco, and potatoes at Calhoun. Experiments have also been made to test the comparative merits of broadcast and drill applications and applications at different dates.

The results show "that the crying want of the Calhoun soils is nitrogen; that the soils of Audubon Park, under favorable seasons, will appropriate one to two rations of nitrogen with profit. Baton Rouge soils are responsive to nitrogen only when properly combined with phosphoric acid."

At Calhoun the order of effectiveness of the different forms of nitrogen was compost of cotton seed, stable manure, and phosphate; crushed cotton seed, nitrate of soda, cotton-seed meal, fish scrap, tankage, sulphate of ammonia, rolled cotton seed, and dried blood. At Audubon Park cotton-seed meal proved the most effective form, followed closely by sulphate of ammonia, fish scrap, nitrate of soda, tankage, and dried blood. At Baton Rouge sulphate of ammonia gave the best results, followed closely, however, by the other forms. It is stated in general that there was little preference in any of these forms of nitrogen. Nitrate of soda appeared to be most effective on light sandy soils, sulphate of ammonia on stiff clay lands.

"At Calhoun, upon thin soils, 1 ration (24 lbs.) of nitrogen is nearly the maximum quantity which crops can now appropriate. With improvement, these soils may digest and render available increased quantities. At Baton Rouge, with favorable seasons, 2 rations (48 lbs.) of nitrogen may be assimilated by the crops with profit, though on account of almost annual droughts, it is unwise to apply, as a rule, larger quantities than 1 ration (24 lbs.). Experiments at both of these stations have determined the above. At Audubon Park 2 rations (48 lbs.) can easily be assimilated by sugar cane in a fair season, provided the soil be well drained and cultivated, *i. e.*, in good tilth. Experiments have shown that 3 rations are excessive and always produce a waste. On cotton, corn, and oats less quantities of nitrogen will suffice. Irish potatoes, cabbage, etc., may easily dispose of with profit 72 lbs. (3 rations) of nitrogen per acre."

The experiments with phosphoric acid indicate "that the soils of Audubon Park and Calhoun require only small doses of phosphates mixed with strongly nitrogenous fertilizers to give remunerative returns, while the soils of Baton Rouge can consume goodly quantities with increased crop products." The soluble forms of phosphoric acid were invariably more profitable than the insoluble. Of the latter, slag meal was most effective, while bone meal in no case gave a profitable return.

"Neither at Calhoun nor Audubon Park have excessive quantities been beneficial. At the former perhaps 24 lbs. soluble phosphoric acid per acre is an abundance for any crop, while 1 ration (36 lbs.) has been found to be ample for the cane crop at the latter station at Baton Rouge. Upon the best character of soils and in favorable seasons 50 lbs. or more to the acre of this ingredient might be profitably applied to certain crops."

"No crop at any of the 3 stations has been benefited by the application of potassic salts."

The results of the experiments with the different methods of application indicated that—

"If the soil be very loamy or clayey and retains fertilizers well, perhaps little or no loss will occur by putting all the manure under the plant at the time of planting. But if the soil be sandy and inclined to 'leach,' fertilizers, particularly nitrogen compounds, should never be applied all at once under fibrous-rooted plants. Mineral fertilizers may be thus applied, since they leach but little, and even complete fertilizers may be thus used under quickly-growing tap-rooted plants. . . .

"Where the soil is open and porous and root development can occur without hindrance, then broadcasting may be done, with chances that the fibrous roots, permeating easily in every direction, may catch most of the applied fertilizers, but in very stiff, compact soils such extensive root development is impossible, and therefore much of the broadcast fertilizer will not be accessible to the roots of the growing crop. As a rule, then, it may be asserted that broadcasting is permissible upon hoed crops in light soils, but wasteful in stiff, heavy soils."

The results of experiments at Calhoun strongly favor 1 application at time of planting under cotton, but "strongly suggest the practice of making at least 3 applications of fertilizers for such plants as corn, cane, etc. At Baton Rouge little or no loss has occurred from 1 application at time of planting. . . . At Audubon Park experiments have been made similar to those discussed above, with 1, 2, and 3 applications, with as yet, no positive evidence against the prevailing custom of 1 application."

As regards the best depth of application "the consensus of results points unmistakably to the depth of 2 to 3 in. as producing the best results, and also shows the advantage of having all the ingredients combined at this depth."

Successful results with a rotation of oats, cowpeas, cotton, corn, and cowpeas are reported, and in conclusion tabulated data are given for experiments with fertilizers on sugar cane at Audubon Park for 1892 and 1893.

Soil tests with fertilizers in Virginia (*Southern Planter, 56 (1895), No. 2, pp. 79-81*).—The Virginia State Board of Agriculture, at its meeting January 8 to 10, 1895, adopted resolutions appropriating a sum not exceeding $1,500 for the purpose of conducting soil tests with fertilizers, not more than $150 of which is to be expended in any one Congressional district. This money is placed under the control of the Commissioner of Agriculture and the members of the State Board of Agriculture from the different districts in which experiments are made. The services of a scientist to aid in selecting and laying out plats, supervising the experiments from time to time, and preparing reports of results are to be secured through the Virginia Agricultural and Mechanical College, or from some other source, provided such services can be procured for a sum not exceeding $500.

The general plan of the experiments is to be that adopted by the convention of directors of experiment stations at Washington, March, 1889.[1] The experiments are to be made "chiefly in those sections of the State where the exhaustion of the soil and the depressed conditions of agriculture indicate their need."

On what kind of soils, to what crops, and in what forms should lime be applied, B. SCHULTZE (*Braunschw. landw. Ztg., 62 (1894), No. 51, pp. 213, 214*).—A popular article in which the draft of different crops on the lime content of the soil, the variation in lime content of different soils, the influence of chemical fertilizers in causing loss of soil lime, the indirect fertilizing action and physical effect of lime, and the comparative merits of marl, gypsum, and burnt lime are discussed.

Development of the natural sources of nitrogen (*Landw. Centbl. Posen, 23 (1895), No. 2, p. 8*).

The utilization of night soil as a fertilizer, J. H. VOGEL (*Deut. landw. Presse, 22 (1895), No. 8, pp. 66, 67*).

The town sewage question in its agricultural relations, R. S. BURN (*Jour. Bath and West of England Soc., 4 (1893-'94), ser. 4, pp. 106-117*).—A general discussion of this subject, critically reviewing present English systems of sewage disposal and urging the advisability of more extended use of city sewage in liquid form on farm lands.

On Kühn's views on the value of barnyard manure nitrogen, P. WAGNER (*Deut. landw. Presse, 22 (1895), No. 8, pp. 62, 63; No. 10, p. 83*).

The rational use of bone meal, M. ULLMANN (*Jour. Soc. Agr. Brabant; L'Engrais, 10 (1895), No. 5, pp. 113, 114*).—A brief popular summary of information as to the soils best adapted to bone meal and the best methods and time of application.

A new potash deposit (*Landw. Centbl. Posen, 23 (1895), No. 2, p. 9*).—The discovery is announced of a potash deposit on the boundary of Beyenrode, near Gifhorn, Hanover. It is a bed of kainit 20 to 30 meters thick and containing 27 per cent of chlorid of potassium. The deposit is calculated to contain 2,400,000,000 centner (about 132,000,000 tons) of the salt.

Commercial fertilizers, W. L. HUTCHINSON (*State Chemist Mississippi Bul. 6, pp. 12.*)—Notes on valuation and tabulated analyses and valuations of 37 official samples of fertilizers sent to the inspector by manufacturers, with a list of manufacturers' guaranties.

FIELD CROPS.

Millet, A. A. CROZIER (*Michigan Sta. Bul. 117, p. 64, figs. 6.*)

Synopsis.—The principal topics treated are the following: Character of soil; amount of seed; draft on soil fertility; curing, soiling, and pasturing millet; effect of millet hay on health of animals; weight, price, and uses of millet seed; diseases and enemies of millet; descriptions of cultivated forms or varieties, and yields of different kinds of millet.

In 1894 there were sown at the station 73 samples of millet seed, including 16 species and varieties. The dry season materially reduced the yields and altered the normal ripening period of the different varieties. Millet thrives best on a warm, loose, fertile soil. Where the soil is poor or where droughts prevail, broom corn millet and common millet are recommended as preferable to German millet; the first mentioned is specially recommended as resistant to drought.

The following table gives the yields of Hungarian grass hay on thirty second-acre plats on light, sandy soil and on loam when 1, 2, 4, and 6 pecks of seed per acre were sown:

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[1] Office of Experiment Stations, Circulars 7 and 8.

Effect of amount of seed on yield of Hungarian grass hay.

	On light, sandy soil.	On heavy loam.
	Pounds.	*Pounds.*
One peck	70	65
Two pecks	41	78
Four pecks	42	74
Six pecks	39	49

Light seeding gave the best results. On another series of plats 3 pecks of seed per acre proved too much for all kinds of millet except broom corn millet, which has relatively large seeds. The author regards 2 pecks of seed as enough on ordinary soils for Hungarian grass, common millet, and German millet. For the production of seed 1 peck sown broadcast, or less if sown in drills, is recommended for all varieties except broom corn millet, of which 3 pecks is preferred.

As a crop for subduing weeds millet is regarded as superior to buckwheat. Millet has been satisfactorily used for soiling and pasturage. For pasturing Hungarian grass is preferred to common millet and German millet. Both timothy and a mixture of clover and timothy failed when sown with millet June 12.

Numerous quotations, representing conflicting opinions, are given as to the effect of millet hay on the health of live stock, especially of horses.

The diseases and enemies of millet are given as sorghum blight (*Bacillus sorghi*), millet smut (*Ustilago segetum* var.), and the chinch bug. Millet has been successfully used as a trap crop for this insect.

Common millet (*Setaria italica*) is small and early. Each root produces numerous slender stems with nodding, tapering heads, moderately compact above but loose at the base. The color of the heads is green, turning to a yellowish brown when ripe. The seeds are large, yellow, and oval.

Hungarian grass (*S. italica germanica*) is medium in maturity and has several stems from each root, erect or nearly erect heads, oblong, dark purple, bristly, and very compact; seeds oval, purple, mixed with yellow immature grains.

German millet (*S. italica*) is relatively late, has single or few large stems from each root; the head is usually nodding, and has purplish awns. The seeds are small, round, and yellow or golden.

Broom corn millet (*Panicum miliaceum*) has panicles resembling those of broom corn and generally grows about 2 feet high. It usually yields less fodder than other sorts, but is valuable both for forage and for seed in portions of the Northwest having short and dry seasons. "It stands drought remarkably well and is better adapted than any other kind to dry climates and poor soils."

Several cultural varieties of broom corn millet were grown, among them Japanese millet, which suffered from drought, but gave the largest yield of forage among the varieties of this group.

Golden Wonder millet (*S. italica*) has very long, tapering heads, with small green or sometimes rose-colored bristles. It is easily affected by drought, and rather late in maturing.

Other kinds of millet described are Missouri millet, California millet (*Setaria italica*), Italian millet (*S. italica*), Japanese millet (*S. italica*), Texas millet (*Panicum texanum*), sprouting millet (*P. proliferum geniculatum*), barnyard grass (*P. crusgalli*), sorghum (*Andropogon sorghum*), Johnson grass (*A. halapense*), and pearl millet (*Pennisetum typhoideum*).

A list of other species to which the name millet has also been applied is given. Tabulated data give number of seeds per gram, shape and size of seeds, and brief notes on the growth of all samples of millet tested.

On the quality of barley grown under different conditions, C. KRAUS and A. STELLWAAG (*Ztschr. landw. Ver. Bayern, 1894, pp. 164–171; abs. in Centbl. agr. Chem., 23 (1894), No. 10, pp. 667–670*).—As the barley grain becomes ripe its composition improves, the percentage of starch increasing and that of nitrogen decreasing. Heavy manuring, when it was accompanied by lodging of the straw, resulted in the formation of light grains with a high percentage of nitrogen and a low starch content. Among the barley grains of a single variety those were most glassy which contained a high percentage of protein, but the protein content was not the only factor concerned.

Cañaigre, E. W. HILGARD (*California Sta. Bul. 105, pp. 1–9*).—This is largely a résumé of all investigations heretofore published by the stations which have tested this crop. It appears that the deeper the tint of the foliage and the root the larger the percentage of tannin in the root, a fact which suggests possible improvement in cañaigre as has been effected in the case of the sugar beet. A comparison of the probable profits in growing black wattles and cañaigre is given, the result of the comparison being somewhat in favor of cañaigre. The following table gives the composition of the ash of cañaigre root, and for comparison the composition of the ash of the sugar beet:

Composition of ash of cañaigre root and sugar beet.

	Cañaigre.	Sugar beet.
	Per cent.	*Per cent.*
Silica	3.89	3.50
Potash	28.74	49.40
Soda	2.47	9.60
Lime	8.16	6.30
Magnesia	16.93	8.90
Brown oxid of manganese	0.98	....
Peroxid of iron and alumina	2.45	1.10
Phosphoric acid	18.19	14.30
Sulphuric acid	13.16	4.70
Chlorin	6.43	2.60
	101.40	100.40
Excess of oxygen due to chlorin	1.40	0.57
Total	100.00	99.83
Percentage of pure ash in dry root	4.48	4.35
Percentage of crude ash in dry root	4.79	5.44
Percentage of carbonic acid in crude ash	5.20	20.00
Percentage of total nitrogen in dry root	1.93	0.87

"Roughly speaking, we are probably justified in assuming that for equal weights of crop the cost of replacing the mineral soil ingredients by the purchase of fertilizers when necessary, will be about the same for both crops (cañaigre and sugar beets); while as regards nitrogen, our determination shows that the cañaigre draws nearly twice as heavily as the beet, so that a crop of 10 tons of fresh roots will take out of the soil nearly 100 lbs. of nitrogen per acre. In regular culture it should, therefore, probably be alternated with leguminous crops, that enrich the soil in nitrogen."

Corn as a silage crop, W. H. JORDAN (*Maine Sta. Rpt. 1893, pp. 57–63*).—This article contains the results of a comparison of silage made from Southern corn and Maine field corn, previously published as Bulletin 11 of the station (E. S. R., 6, p. 34), and a study of the ripening of silage corn. On each of 10 twentieth-acre plats one fifth of the area of corn was cut at 5 different dates. The following table gives the yield of green corn and of dry matter resulting from harvesting the crop at different stages of growth:

Yield of green corn and dry matter in an acre of corn at different stages of growth.

Date of cutting and condition of crop.	Days in each period of growth.	Yield of green corn per acre.	Dry matter.		Gain in weight in each period.	Rate of gain per day.
			In crop.	Yield per acre.		
		Pounds.	*Per cent.*	*Pounds.*	*Pounds.*	*Pounds.*
August 15, ears beginning to form	....	26,166	11.71	3,064.0	....	....
August 28, a few roasting ears	13	29,777	17.50	5,210.9	2,146.9	165.0
September 4, all roasting ears	7	31,000	19.55	6,060.5	849.6	121.3
September 12, some ears glazing	8	28,833	23.17	6,680.6	620.1	77.5
September 21, all ears glazed	9	27,777	25.34	7,639.7	358.1	39.8
Total increase after August 15	....	....	....	....	3,974.7	....

The following table gives the amounts of the different nutrients contained in the corn crop at different dates:

Yield per acre of different classes of nutrients of the corn plant at different stages of growth.

Date of cutting.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Sugars.	Starch.	Fat.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
August 15, ears beginning to form[1]	285.9	458.4	812.3	1,428	358.5	....	79.7
August 28, a few roasting ears	338.7	611.7	1,214.0	2,892	1,064.0	108	153.7
September 4, all roasting ears	376.3	689.6	1,192.0	3,621	1,248.0	297	181.8
September 12, some ears glazing	372.4	639.5	1,291.0	4,177	1,407.0	357	200.4
September 21, all ears glazed	416.1	649.8	1,309.0	4,457	1,161.0	1,083	208.4
Gain after August 15	130.2	191.4	496.7	3,029	802.5	1,083	128.7
Gain after August 28	77.4	38.1	95.0	1,565	97.0	975	54.7

[1] The manner of drying the sample taken from the lot cut at this period may have caused a loss of sugar.

"Two facts are clearly shown: First, that the later growth of dry matter in the corn plant is made up chiefly of non-nitrogenous compounds; and second, a large percentage of these compounds consisted of sugars and starch, substances that are the best of their class for the purposes of animal nutrition."

Variety tests of oats, H. J. WATERS and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 116, 117*).—Fifteen varieties were tested in 1893 on duplicate twentieth-acre plats. Tabulated data give yields for each year of all varieties tested. The average yields per acre for 1890, 1891, 1892, and 1893 were as follows:

Average yield per acre for 4 years of varieties of oats.

Variety.	Bushels.	Variety.	Bushels.
Baltic White	43.62	Early Russian	37.13
Japan	42.62	Henderson Clydesdale	36.89
Improved American	42.35	Welcome	35.59
German	41.03	Des Flandres	34.27
Scottish Chief	40.91	Jaune des Flandres	32.75
Wide Awake	39.13	White Bonanza	32.52
White Victoria	37.89	White Wonder	30.06
Haggett White Seizure	37.14		

Influence of maturity upon the yield of dry matter in soiling rye, H. J. WATERS (*Pennsylvania Sta. Rpt. 1893, pp. 52–54*).—This experiment was conducted on 9 plats each 6 by 100 ft. On 3 plats rye was cut just before heading, May 19; on 3 plats it was harvested when three quarters headed, May 24; on the other plats the crop was cut when in blossom, May 31. The rye cut before heading yielded 1,624.94 lbs. of dry matter per acre; that three quarters headed 2,702.79 lbs.; and that cut when in blossom 3,763.94 lbs. Assuming that the 3 lots of rye were equally digestible, the calculated yield of digestible matter per acre was as follows:

Yield of digestible matter per acre in rye cut at different stages of growth.

State of maturity.	Dry matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Before heading	1,189.3	68.58	160.29	369.1	555.3	36.05
Three fourths headed	1,986.5	96.22	212.54	696.0	937.0	44.71
In blossom	2,780.8	133.61	248.45	1,161.0	1,180.3	57.43

As much digestible dry matter was produced by 1 acre of rye cut when in bloom as by 2.34 acres cut 12 days previously and just before heading.

Australian salt bush, M. E. JAFFA (*California Sta. Bul. 105, pp. 10–16*).—The Australian salt bush (*Atriplex semibaccata*), grown at the Tulare Substation on some of the worst alkali spots on the grounds, yielded at the rate of about 5 tons of dry matter per acre. It is readily propagated by seed. Sheep and hogs eat the green plant readily, and horses and cattle soon get accustomed to it when mixed with other food at first. The following table gives the proximate composition of this plant:

Composition of Australian salt bush.

	Fresh.	Air-dried.	Water-free.
	Per cent.	*Per cent.*	*Per cent.*
Moisture	78.03	7.05	....
Albuminoids	2.75	11.64	12.53
Nitrogen-free extract	10.41	44.05	47.39
Fat	0.48	2.01	2.16
Fiber	3.75	15.88	17.08
Ash	4.58	19.37	20.84
Total	100.00	100.00	100.00

"The preceding analyses prove that this fodder is one of considerable merit."

The following table gives the composition of the ash:

Composition of the ash of Australian salt bush.

	Per cent.
Silica	16.24
Potash	11.42
Soda	35.39
Lime	5.79
Magnesia	3.23
Peroxid of iron	1.38
Alumina	1.95
Brown oxid of manganese	0.22
Phosphoric acid	2.80
Sulphuric acid	2.64
Chlorin	24.33
	105.35
Excess of oxygen due to chlorin	5.35
Total	100.00
Per cent of pure ash in air-dried substance	19.37

Although a ton of the air-dried plant contains nearly 14 lbs. of potash and 3½ lbs. of phosphoric acid, the fertilizing value of the ashes is more than balanced by the large amount of injurious alkali which it contains. A crop of 10,000 lbs. of dry salt bush removed 21.3 lbs. of potash, 5.93 lbs. of phosphoric acid, and 18.60 lbs. of nitrogen from the soil. By analyzing the alkali spots on which the plant was grown and the crop itself, it was found that a single crop of Australian salt bush removed 2.5 per cent of the total potassium sulphate in the soil, 2.99 per cent of the sodium chlorid, and 2.21 per cent of the sodium carbonate. "Soils where the percentages of alkali are near the limit of tolerance can no doubt be sensibly relieved by planting the salt bush and permanently removing each cutting from the land."

Fertilizer experiments with tobacco, W. FREAR (*Pennsylvania Sta. Rpt. 1893, pp. 82–112*).

Synopsis.—This is a report of progress on an experiment conducted by the station in coöperation with the Lancaster County Tobacco Growers' Society. Tabulated data give the yields of unfermented tobacco; the results are discussed at length.

General discussions on the tobacco crop, on the soil and climate of Lancaster County, and on the theory and practice of manuring the crop precede an account of the experiments conducted in 1893 at 2 localities in Lancaster County.

The questions investigated were: (1) Effects of phosphoric acid on limestone soils; (2) relative values of sulphate of potash and double carbonate of potash and magnesia; (3) cotton-seed meal, linseed meal, horn meal, and mixed cotton-seed meal and nitrate of soda as sources of nitrogen in complete fertilizers; (4) relative values of stable manure and chemical fertilizers; and (5) profit from the use of the above-mentioned fertilizers.

"As a basis of comparison it was determined that with a single exception all the artificial fertilizers should have the following composition:

	Per cent.	Pounds per acre.
Nitrogen	4.75	95
Phosphoric acid (available)	7.75	155
Potash (water soluble)	7.75	155

"This corresponded to the composition and quantity recommended for use in the case of one of the most popular tobacco manures."

This formula was of necessity not strictly followed in 1893. The fertilizers used cost at retail prices $27.22 to $41.77 per acre.

At Donegal the experiment occupied 20 twentieth-acre plats and at Rocky Springs 10 twentieth-acre plats, using duplicate plats in both localities.

At Donegal the soil was a limestone clay; the surface soil was 6 or 7 in. deep, and the subsoil a heavy yellow clay. Drought obscured the results. However, phosphoric acid appeared to increase the yield of leaf and of wrapper leaf. Double carbonate of potash and magnesia gave a slightly larger yield than sulphate of potash. The results from cotton-seed meal were regarded as slightly more favorable than those from linseed meal. Nitrate of soda (one-half applied interculturally) appeared to reduce the yield of wrappers. Barnyard manure showed no superiority over commercial fertilizers.

At Rocky Springs the soil was thin and "gravelly," belonging in the limestone class. Drought and hail vitiated the results. Here phosphoric acid was without marked effect.

The yield and quality of the fermented tobacco and the results of the chemical studies on the crops are to be published later.

Experiments with wheat, H. J. WATERS and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 112–115, dgm. 1*).—These consisted of tests of varieties and of seed selected by hand in comparison with that from the threshing machine. No marked differences in yield resulted from the 2 classes of seed. On duplicate twentieth-acre plats 26 varieties of wheat were tested in 1892 and 33 varieties in 1893. Tabulated data give yields of every variety for each year tested. The average yields per acre for 1890, 1891, 1892, and 1893 were as follows:

Average yields of different varieties of wheat for 4 years.

Variety.	Bushels.	Variety.	Bushels.
Reliable	32.33	**Extra Early Oakley**	27.41
Valley	30.97	Diehl **Mediterranean**	27.25
Currell Prolific	30.97	Fultz	27.18
Deitz Longberry Red	30.84	German Emperor	26.98
Wyandotte Red	30.71	**Mealy**	26.86
Fulcaster	30.52	Nigger	26.08
Ontario Wonder	29.54	Deitz	25.98
Mediterranean	28.90	McGhee White	25.47
Theiss	28.35	Tuscan Island	25.19
Raub Black Prolific	28.23	Velvet Chaff	24.67
Democrat	28.08	Finley	24.39
Red Fultz	27.78	Improved Rice	23.18
Sibley New Golden	27.56	**Miller Prolific**	22.18

The culture of autumn catch crops, P. P. DEHÉRAIN (*Ann. Agron., 21 (1895), No. 1, pp. 5–16; abs. in Compt. Rend., 120 (1895), No. 2, pp. 59–64*).—The author had previously shown[1] that on soil kept entirely bare of vegetation the loss of nitrates through the drainage water was very considerable. In practice, however, after the removal of a grain crop, weeds and shelled grain germinate and afford some vegetation during the autumn. Hence he compared the amounts of nitrates lost in the drainage water of land covered with grass and that on which a crop of clover was growing. With grass the loss per hectare during the autumn of 1893 was 13.78 kg., with clover 22.18 kg. This heavy loss with both kinds of vegetation was attributed to the dryness of the summer of 1893 and to the fact that when the autumn rains came the plants were too feeble to appropriate all of the nitrates at their disposal. In 1894 the drainage water from the grass pots contained 9.76 kg. of nitric nitrogen per hectare, that from the clover pots 15.63 kg.

The office of catch crops is twofold, to take up nitrates during their growth and to supply nitrogenous matter to the soil after being plowed under. From the preceding figures grass was more active than clover in preventing the escape of the nitrates. However, clover when plowed under afforded 79.59 kg. of nitric nitrogen per hectare, while rye grass furnished only 55.15 kg., thus showing the superiority of clover as a crop for green manuring.

An investigation by M. Bréal confirmed the above results. He found in 1 kg. of soil which received no green manure 141 mg. of nitric nitrogen; in the same amount of soil in which rye grass had been turned under, 190.8 mg.; and in the same amount of soil in which alfalfa had been turned under, 289.4 mg.

In 1894 vetch sown on stubble in August and plowed under late in October or November afforded 78 to 90 kg. of nitric nitrogen per hectare, which is estimated as equal to 15,600 to 18,000 kg. of manure.

It was found that the dry matter of the roots of wheat contained a larger percentage of nitric nitrogen than that of rye grass and much more than that of clover.

The effect of chlorin compounds on yields of peas, grains, and potatoes, and on the starch content of potatoes, J. SCHULTE (*Magdeb. Ztg., 1894, No. 244; abs. in Centbl. agr. Chem., 23 (1894), No. 10, pp. 706, 707*).—The following chemicals were applied to peas, rye, barley, and potatoes: Calcium chlorid, magnesium chlorid, sodium chlorid, magnesium sulphate, and potassium sulphate. None of these chemicals reduced the yield of grain nor the percentage of starch in the potato tubers. Indeed, the yield of potato starch on the plat to which magnesium chlorid was applied was somewhat larger than on the untreated plat.

Fertilizer experiments on corn, oats, wheat, and grass, H. J. WATERS and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 65–81*).—

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[1] Ann Agron., 19 (1893), No. 7, pp. 305-338 (E. S. R., 5, p. 419).

This is a report on rotation experiments with corn, oats, wheat, and timothy and clover on 4 series of 36 eighth-acre plats, commenced in 1881.[1] All fertilizers were applied annually. Nitrogen was supplied at the rate of 24, 48, and 72 lbs. per acre in the form of dried blood, nitrate of soda, or sulphate of ammonia; also as barnyard manure, the amount of nitrogen in the latter not being determined. Phosphoric acid was supplied at the rate of 48 lbs. per acre in the form of dissolved bone-black. Potash was furnished at the rate of 100 lbs. per acre in muriate of potash. Gypsum, lime, ground limestone, and ground bone were also used in a few instances.

Tabulated data give for each plat the yields of corn, stover, oats, oat straw, wheat, wheat straw, and hay for 1892 and 1893, and the average yields of the 12 years during which the experiment has been in progress.

The following table gives the average increase in yield of the different crops during 12 years with complete fertilizers containing 24 lbs. per acre of nitrogen in different forms, and with complete fertilizers containing 24, 48, and 72 lbs. of nitrogen per acre:

Average increase in yield for 12 years with different fertilizers.

Fertilizer.	Corn.	Wheat.	Oats.	Timothy and clover.
	Bushels.	*Bushels.*	*Bushels.*	*Pounds.*
Dried blood and minerals	6.93	3.76	6.21	−80
Nitrate of soda and minerals	10.53	4.80	6.04	473
Sulphate of ammonia and minerals	13.28	5.90	6.54	666
24 lbs. of nitrogen and minerals	7.35	2.49	5.51	681
48 lbs. of nitrogen and minerals	8.73	5.03	7.03	545
72 lbs. of nitrogen and minerals	12.17	6.15	6.23	508
Barnyard manure	8.52	3.17	5.68	395

Notes on plants distributed by the station, E. J. WICKSON (*California Sta. Bul. 106, pp. 8, figs. 2*).—Brief descriptive notes on the most important plants distributed are given. *Polygonum sachalinense* "is a coarse plant and is not advocated as a substitute for well-known forage plants where the latter are satisfactory. For dry lands scant of useful growth the plant is commended for trial. It has a perennial root which withstands both drought and freezing of the ground." Australian salt bush (*Atriplex semibaccata*) made in Tulare County a wonderful growth on strongly alkaline soil. The flat pea (*Lathyrus sylvestris*), from reports received from growers, appears to be much valued in some parts of California. The following forage plants have been found the most satisfactory for dry soil, but are not offered as substitutes for better plants on naturally moist land: Tall oat grass (*Arrhenatherum avenaceum*), Schrader's brome grass (*Bromus unioloides*), Hungarian brome grass (*B. inermis*), Japanese wheat grass (*Agropyrum japonicum*), many-flowered millet grass (*Milium multiflorum*), hairy-flowered paspalum (*Paspalum dilatatum*), and Texas blue grass (*Poa arachnifera*).

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[1] See also Report of the Station for 1890, p. 124 (E. S. R., 3, p. 718).

The square-pod pea (*Lotus tetragonolobus*) is an annual leguminous plant which at the station on 2 different plats yielded at the rate of 24 and 26 tons of green material per acre. Other plants for distribution are Jesuits' tea (*Psoralea glandulosa*), Persian table grapes, Italian wine grapes, olive cuttings or scions, tree tomato of Jamaica (*Solanum betaceum*), cañaigre, rice, sugar cane, 2 varieties of beans, 1 of wheat, zigzag corn, and New England spinach (*Tetragonia expansa*).

Cultural methods for improving the yield of barley, M. HOLLRUNG (*Ztschr. landw. Ver. Hessen, 1894, No. 52, pp. 424, 425*).

Beets running to seed, RIMPAU (*Deut. landw. Presse, 21 (1894), No. 102, pp. 984, 985*).—A discussion of the influences which cause certain biennial plants to form seed stems during the first year of growth.

Cañaigre, B. M. LELONG (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 420–425, pls. 3, figs. 2*).—A general discussion of the culture of cañaigre (*Rumex hymenosepalus*), chiefly compiled from Arizona Station Bulletin 7 (E. S. R., 4, p. 804). Analyses of the root are given, and the plant and its roots and seeds are illustrated.

List of forage and miscellaneous plants under trial, O. LUGGER (*Minnesota Sta. Rpt. 1893, pp. 291–307*).—The author has under trial in small plats 546 forage and miscellaneous plants as follows: Grasses, 437 species; legumes, 92 species; and miscellaneous forage, textile, and oil-producing plants, 17 species. The object of the trials is to offer as many species as possible to the students for study and to ascertain what ones are adapted to the climate of the State. Nothing is given as to the relative value of the species tested.

Proximate analysis of upright brome grass (Bromus erectus), E. KINCH (*Agl. Students' Gaz., n. ser., 7 (1894), No. 2, p. 48*).

Sisal hemp in the Bahamas (*Kew Misc. Bul. 96, pp. 412–414*).

Fertilizer experiments on oats (*Agl. Students' Gaz., n. ser., 7 (1894), No. 2, pp. 39–42*).

Variety tests of potatoes, H. J. WATERS and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, p. 117*).—The yields and brief descriptive notes are given in the form of tables for 12 varieties tested on twentieth-acre plats. The most productive was Early Puritan, followed by Green Mountain and Empire State.

Variety tests and experiments with green manures for potatoes, CROCHETELLE (*Ann. Agron., 21 (1895), No. 1, pp. 17–34*).

Increasing the harvest by selecting seed potatoes, A. SEMPOTOWSKI (*Deut. landw. Presse, 22 (1895), No. 3, p. 21*).

Storing and keeping potatoes, G. FABIUS (*Ind. Lait., 15 (1895), No. 2, p. 12*).

The soja bean, its origin, properties, and acclimatization, E. MARTIN (*Rev. Scientif., 3 (1895), ser. 4, No. 5, pp. 144–146*).

Soja beans, F. E. EMERY (*Southern Planter, 1895, Feb., pp. 56, 57*).

Sugar beets, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 63–72*).—A reprint from Bulletin 27 of the station (E. S. R., 4, p. 723).

The Lahaina sugar cane (*Kew Misc. Bul. 96, pp. 418, 419*).

The introduction of tobacco into France, E. ROZE (*Jour. Bot. France, 8 (1894), No. 21 and 22, pp. 375–380*).—An historical sketch.

Experiments with wheat, A. C. MAGRUDER (*Oklahoma Sta. Bul. 12, pp. 4*).—These consisted of tests of varieties, dates of sowing, and an experiment in manuring wheat. On the manured portion of the field the variety making the largest yield was Currell; on the unmanured portion, Sibley Hybrid. Stable manure largely increased the yield. Wheat was sown at intervals of one week from September 7 to the following January. The largest yield resulted from the sowing made September 21.

Chemical investigation of seed wheat and of the wheat plant, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 147–160*).—A reprint of Bulletin 29 of the station (E. S. R., 5, p. 867).

Experiments with wheat, oats, barley, corn, and potatoes, A. BOSS (*Minnesota Sta. Rpt. 1893, pp. 201–214*).—A reprint from Bulletin 31 of the station (E. S. R., 5, p. 1073).

Seed growing in Germany, E. SARSSON (*Gard. Chron., 17 (1895), ser. 3, p. 136*).—An account of the seed industry at the town of Quedlinburg.

Making silage by the use of Blunt's press, MÜLLER (*Ztschr. landw. Ver. Bayern, 84 (1894), Nov., pp. 868–872*).

HORTICULTURE.

Classification of the sexual affinities of Prunus americana vars., C. W. HEIDEMAN (*Expt. Sta. New Ulm, Minnesota, Rpt. 1894, pp. 10, pls. 2*).—This consists of a report of investigations upon the fertilization of plums, those used in the experiments being chiefly wild trees, although a few cultivated varieties were also employed. Numerous crosses were made, and a careful anatomical and physiological study of the pistils and anthers was undertaken, to determine the forms best adapted for self and cross fertilization and to ascertain the reasons of self and cross sterility. The flowers were found to fall in 3 groups, each with 2 subdivisions: Dichogamous, comprising proterogynous and proterandrous; Heterostyled, comprising long-styled and short-styled; and Bisexual, comprising gynodiœcious and andromœcious. The hermaphrodite form was found to be not common. The period of bloom usually lasts for 3 days to a week, although the actual time in the life of a blossom during which fertilization may be effected was found rarely to exceed 2 hours, beginning from 2 to 24 hours after the blossom has fully expanded.

The crosses between these various forms of flowers were found to vary greatly, in some cases not being possible. Reciprocal crosses were also found to vary in the intensity of fertilization. The term illegitimate is applied to such union of the reproductive elements as results in development of the ovary below the normal. Out of 49 possible combinations of pollination only 13 are considered legitimate, the others giving negative or but feeble results. Figures are given of the various forms of flowers and a diagram showing different ways in which fertilization can be accomplished.

Strawberry culture, W. B. ALWOOD (*Virginia Sta. Bul. 37, pp. 13–19*).—Descriptive and cultural notes and tabulated data on 39 varieties of strawberries grown on the station farm. The plants were mulched the previous fall with straw, which was not removed until the middle of April, thus sheltering the plants through the winter and until after the spring frosts. Uncovered plants bloomed in March and were killed by a severe freeze the latter part of the month. The rainfall was less than normal and the mean temperature of the spring was low, resulting in a reduced crop of berries, only about one third the average yield being matured. Three tables are given, one showing the comparative yield of the varieties as determined from 6 plants of each sort, another giving the dates of bloom and fruit production and quality, and the third giving data for the 10 most productive varieties. Brandywine, Cyclone, Longfield, and Tennessee, comparatively new varieties, are considered among the best. A list of 134 varieties, tested up to date at the station, is given.

The grafting of grapes, E. G. LODEMAN (*New York Cornell Sta. Bul. 77, pp. 459–476, figs. 16*).

Synopsis.—Illustrated directions for the various methods of grafting grapes, with remarks on the physiology of grafting.

Introduction (pp. 459–464).—The structure of the grape stem is described and figured and the physiology of the combination of the stock and scion is given. It is urged that the scion be dormant or at least less active than the stock. Grafting is recommended to be performed either in the fall after the flow of sap has ceased, early in the spring before the flow has begun, or in late spring when the first activity of the sap has diminished. Early spring is considered as perhaps the most suitable time.

Methods of grafting (pp. 464–475).—Directions are given for making cleft grafts, crown grafts by inlaying, cutting grafts, modified tongue grafts, side grafts on stocks, and on root cuttings. The directions are given in detail and the implements and processes are fully illustrated. Cleft grafts are mentioned as being made by either completely or only partially severing the stock. Grape grafting is believed to be followed by better results if the scions are inserted below the surface of the ground. Cleft grafting and side grafting are considered the most suitable and satisfactory methods. Cuttings are best grafted by tongue graft.

A concise summary is given embodying the important points made in the bulletin.

Fruits, R. L. WATTS (*Tennessee Sta. Bul., vol. VII, No. 2, pp. 143–156*).

Synopsis.—Cultural and varietal notes on grapes, strawberries, raspberries, blackberries, pears, apples, and peaches.

Grapes (pp. 143-150).—Ninety varieties, comprising 391 vines, are being grown in the station vineyard, most of which fruited the past season. Brief descriptive notes are given on 31 varieties. The diseases, black rot and brown rot, attacking the vines and leaves, are briefly described, and directions for treatment by spraying with copper sulphate, Bordeaux mixture, or ammoniacal carbonate of copper are given; formulas for preparing these fungicides are included. The culture given the vineyard is briefly mentioned.

Strawberries (p. 150).—Brief notes on several varieties, the yield being greatly diminished by spring frost. Crescent, Haverland, Jessie, Windsor Chief, and Bubach were most productive.

Raspberries (pp. 150, 151).—Brief descriptive and comparative notes on the following varieties: Turner, Reliance, Golden Queen, Cuthbert, and Shaffer Colossal. The black caps were injured by frost and bore very scantily.

Blackberries (p. 151).—A list of 11 varieties, arranged in order of productiveness, Early Cluster and Kittatinny giving much the heaviest yields.

Pears (p. 151).—Notes on the culture of the pear orchard belonging to the station, the varieties Bartlett, Kieffer, and Beurre Giffard being planted.

Apples (pp. 152, 153).—Notes on work being done in the preparation of a catalogue of Tennessee apples. The fruit and foliage are photographed, and careful notes are made. In the case of promising seedlings, grafts are made upon bearing stocks in the station orchard. Coöperative work on the apples of the State is being done by numerous correspondents.

Peaches (pp. 153–155).—Notes on investigations in regard to peach growing in Tennessee, with brief recommendations for satisfactory culture. Information from peach growers of the State is requested in regard to various seedlings, soils, diseases, and culture.

A list of the donations to the horticultural division of the station in 1894 is appended.

Report of the horticulturist, W. M. MUNSON (*Maine Sta. Rpt. 1893, pp. 101–144, figs. 2*).

Synopsis.—This contains reports on the work of the year, comprising notes on cabbages, cauliflowers, tomatoes, eggplants, spraying experiments, and a catalogue of Maine fruits.

Cabbages (pp. 101–105).—Experiments were made to determine the influence of transplanting young plants, the effect of trimming at the time of setting in the field, and the result of holding plants in check. Plants twice handled in pots gave results slightly superior to those obtained from like plants handled the same number of times in boxes. In no case did the plants from boxes produce heads equal to the best of those from pots. The results obtained by reducing the amount of foliage at the time of setting in the field were almost negative. The results of 2 seasons' experiments indicated that little advantage is to be derived from the practice. Holding plants in check on account of severe weather by closely heading them back was found to render them earlier and slightly larger than others left untreated as checks. It is advised to prune the foliage of the plants likely to become drawn and crowded before planting out. The data for the experiments are tabulated.

Cauliflowers (pp. 105–111).—Chiefly a reprint of Bulletin 10 of the station (E. S. R., 6, p. 51). In addition are given tabulated data for the handling of cauliflowers in pots *vs.* boxes, the effect of trimming cauliflowers at the time of planting, and a comparison of 30 varieties of cauliflowers. An increased percentage of marketable heads, amounting in some varieties to 20 per cent, was the result of handling the young plants in pots. In the experiment of trimming plants the per cent of heads formed was greater for plants not trimmed, though there was no difference in earliness or size of the heads. Early varieties produced more marketable heads than did the late, and where the heads produced were very large the percentage of plants heading was correspondingly small.

Tomatoes (pp. 112–118).—Chiefly a reprint of Bulletin 9 of the station (E. S. R., 6, p. 51), with the addition of tabulated data on the effect of early setting, value of pot culture, individual variation, and a comparison of first and second generations of crosses. Early setting is recommended, though the advantage gained in earliness and productiveness of fruit was but slight. Plants handled 3 times in pots showed a marked increase in productiveness over those transplanted a like number of times in boxes. The individual variation within varieties was found to be often so much as to obscure the effects of different methods of culture. A cross between the Ignotum and Peach varieties showed a marked falling off in the second generation over the advantage indicated by the first, although this may have been due to greater care given the first generation.

Eggplants (pp. 118–121).—Notes and tabulated data on early *vs.* late setting, deep *vs.* shallow cultivation, frequent cultivation, and the effects of root pruning. Early setting, when the plants escaped injury by frost, gave a large advance in the percentage of plants bearing marketable fruits, in the case of the Black Pekin variety amounting to 35 per cent. Deep cultivation with a horse hoe gave much better results than shallow hand work. Experiments with frequent cultivation were obscured by the failure of the varieties employed. Root pruning gave contradictory results.

Potatoes (pp. 121–124).—A reprint of Bulletin 12 of the station (E. S. R., 6, p. 632).

Spraying experiments (pp. 124–128).—A reprint of Bulletin 8 of the station (E. S. R., 5, p. 1077). In addition is given a table showing the details of an experiment in spraying to prevent apple scab, merely the results of which are given in the bulletin.

Catalogue of Maine fruits (pp. 129–144).—Tabulated data for 110 varieties of apples, 9 of crab apples, 14 of blackberries, 2 of dewberries, 20 of cherries, 10 of currants, 5 of gooseberries, 14 of grapes, 3 of quinces, 35 of pears, 29 of plums, 17 of raspberries, and 25 of strawberries. In addition, lists are given of the varieties believed to be profitable for the northern and southern counties of the State, and apples for home use and for market, with several varieties found unsatisfactory in the northern counties.

Small fruits in 1893, G. C. BUTZ (*Pennsylvania Sta. Rpt. 1893, pp. 118–126*).—Cultural and descriptive notes and tabulated data for 34 varieties of strawberries, 20 of raspberries, 10 of blackberries, 9 of currants, and 6 of gooseberries. Greenville and Shuster Gem gave the heaviest yield of strawberries, and the total yield from mats was 10 per cent better than that from hills. Of raspberries Caroline, Brinkle Orange, Marlboro, Cuthbert, Rancocas, Shaffer Colossal, Souhegan, Mammoth Cluster, and Ohio are recommended as the best of the different colors they represent. Early Harvest, Eldorado, Jewett, and Snyder proved the best blackberries; and the Cherry, Red Dutch, and White Grape were the most productive currants. The Smith gooseberry yielded the most fruit, followed closely by the Houghton.

Manuring of fruit trees, LIERKE (*Mitt. deut. landw. Ges., 1893-'94, No. 12, pp. 167-171; abs. in Centbl. agr. Chem., 23 (1894), No. 10, pp. 702, 703*).—Notes on fertilizer experiments begun in 1891 under the direction of the Dresden Agricultural Experiment Station, in orchards on the manor of Rottwerndorf. Twenty-three plats were employed, being treated with various animal manures and different combinations and quantities of chemical fertilizers. At this time the nitrogen and potash fertilizers seem to be producing too vigorous a growth of foliage and shoots, to the detriment of the fruit, but the results are not yet established or conclusive, and the experiments are to be further pursued.

On the manuring of fruit and garden crops and the relation of live stock to fertility, J. W. FIELDS (*Pennsylvania Sta. Rpt. 1893, pp. 61-65*).—A general, popular paper on intelligent horticultural fertilizing. Tables are given showing the fertilizing content of the more common orchard and small fruits and garden vegetables. In growing these crops the return of nitrogen to the soil is urged to be as essential as the return of potash and phosphoric acid, an amount approximating that removed, depending on the nature of the soil and its natural fertility, being returned. A formula is given for a general fertilizer. The value of manure from farm animals in returning to the soil the fertilizing constituents taken from it by the crops is briefly mentioned, and a table is given showing the number of pounds of fertilizing ingredients in a ton of various farm products, and some commercial feeding stuffs with their fertilizing value per ton.

Tests of vegetables in 1893, G. C. BUTTS and G. BALDWIN (*Pennsylvania Sta. Rpt. 1893, pp. 126-142*). Descriptive notes and tabulated data on 6 varieties of bush Lima beans, 6 of bush beans, 6 of pole beans, 6 of beets, 1 of celery, 7 of early cabbage, 4 of late cabbage, 11 of corn, 9 of cucumbers, 11 of lettuce, 7 of onions, 16 of peas, 10 of squash, and 25 of tomatoes. A list of donations to the horticultural division of the station during 1893 is appended.

Glasshouses, their construction and heating, H. W. GIBBONS (*Amer. Florist, 10 (1895), No. 350, pp. 377, 378*).—Detailed architectural directions for building plant houses.

Horse-radish, G. M. STRATTON (*Amer. Gard., 16 (1895), No. 32, p. 54*).—Detailed cultural notes.

The cultivation of the melon, W. PALMER (*Jour. Hort., 1895, No. 2419, pp. 118, 119, fig. 1*).—A popular article on growing melons in hothouses in England, giving full directions for producing prize fruit. The illustration is from a photograph of a plant of the Triumph variety, loaded down with fruit, and supported on wires.

Edible and poisonous mushrooms, C. COOKE (*London: 1894, pp. 126, figs. 18*).—Reviewed in *Rev. Scientif., 10 (1895), No. 3, p. 84.*

Edible fungi in Surrey, C. A. BRIGGS (*Sci. Gos., n. ser., 1 (1895), No. 11, pp. 251, 252*).—The author mentions the following species as edible: *Agaricus campestris, A. arvensis, A. gambosus, A. rubescens, A. vaginatus, A. prunulus orcella, A. personatus, A. nudus, Boletus lutens, Lycoperdon plumbeum, L. bovista, Morchella esculenta, Sparassis crispa,* and *Fistulina hepatica,* all of which he says are easily recognized and very palatable.

Rhubarb (*Amer. Gard., 16 (1895), No. 32, p. 46, fig. 1*).—Brief notes on planting, fertilizing, and marketing.

Sago cultivation in Borneo (*Kew Misc. Bul. 96, pp. 414–417*).

The apricot, B. M. LELONG (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 29–55, figs. 12*).—An elaborate paper treating of the origin of the apricot, its propagation, soil, planting, pruning, thinning, fruit picking, grading, cutting for drying, sulphuring, drying, sweating, packing the dried fruit, and illustrated, descriptive, and comparative notes on 35 varieties. Notes from various growers in the State bearing on different points are included. California is believed to be peculiarly adapted to the apricot. Special stress is laid on the preparation of the dried fruit. Illustrations are given of apricot trees and orchards, showing the manner of growth and the effect of proper pruning.

The cherry, B. M. LELONG (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 55–63, pls. 19, figs. 2*).—Notes on the growing of cherries in California, with remarks on the soil, propagation, planting, pruning, cultivation, picking and packing, diseases and pests, and illustrations of 26 leading varieties, many of which are figured for the first time. The pits of 31 varieties are figured to show the different types of form for classification purposes. The rich valley lands of the State are the principal cherry producing sections, and a number of valuable varieties have been originated in California. Notes from several cherry growers of the State are incorporated.

Fig culture and fig packing, D. SHERMAN (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 234–236*).—Notes on the cultivation, gathering, processing, and packing of figs, the different steps of the preparation for market being given in detail.

Curing the white Adriatic fig, G. A. RAYMOND (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 270–272*).—A detailed account of the method of curing this variety of fig employed by the author.

The pomelo, B. M. LELONG (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 63–65*).—Brief descriptive remarks on *Citrus pomelanus* and its value as a medicinal fruit. Several newspaper articles are included. The cultivation of the pomelo in California is urged.

Prune culture from a commercial standpoint, J. E. GORDON (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 204–213*).—A general paper on the growing of prunes, embodying earnest recommendations as to the best methods of cultivating, picking, drying, and marketing.

The mulberry, G. ABBEY (*Jour. Hort., 1895, No. 2419, pp. 112, 113*).—A popular paper on the cultivation and uses of the tree, leaves, and fruit, including an historical sketch.

The buffalo berry, L. C. CORBETT (*Amer. Gard., 16 (1895), No. 32, p. 45, figs. 2*).—An illustrated article pointing out the distinction between the staminate and pistillate forms of *Shepherdia argentea.* The paper was read at the last meeting of the Association of American Agricultural Colleges and Experiment Stations.

Dewberries are worth cultivating, I. N. STONE (*Amer. Gard., 16 (1895), No. 32, p. 45*).—Brief notes on the growing of dewberries, the variety Bartel being preferred to Lucretia, as it is more prolific and nearly thornless.

Rubus australis, W. J. BEAN (*The Garden, 47 (1895), No. 1212, p. 100, fig. 1*).—Descriptive notes on this New Zealand bramble, which is advised as an addition to cool conservatories.

Cross fertilization of grapes, S. B. GREEN (*Minnesota Sta. Rpt. 1893, pp. 229–231, fig. 1*).—A reprint from Bulletin 32 of the station (E. S. R. 6, p. 46).

Pot grapevines vs. planted canes, G. WYTHES (*Gard. Chron., 17 (1895), ser. 3, p. 176*).

The importance of hybrids in replanting vineyards, A. MILLARDET (*Compt. Rend., 119 (1894), No. 26, pp. 1176–1180*).

Three years' observations on the action of plaster in viticulture, G. BATTANCHON (*Prog. Agr. et Vit.; L'Engrais, 10 (1895), No. 5, pp. 114, 115*).

Fruits and soils of the arid region, E. W. HILGARD (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 303–312*).—A paper embodying the results of over a thousand analyses of soils from arid regions. Compared with analyses of humid soils, the arid lands possess about 3 times as much potash and 12 to 14 times as much lime, while there is no material difference in phosphoric acid. Analyses of fruits indicate that those grown in arid regions were of better quality, particularly possessing more sugar. Attention is drawn to the fact that the earliest civilization originated in localities with but scanty rainfall, such as Egypt and India. Some of the analyses of soils of the United States are tabulated.

Fruits, notes on varieties, S. B. GREEN (*Minnesota Sta. Rpt. 1893, pp. 239–247*).—A reprint from Bulletin 32 of the station (E. S. R. 6, p. 55).

Fruit forcing (*Jour. Hort., 1895, No. 2419, pp. 124, 125*).—Brief directions for forcing pineapples, figs, cherries, strawberries, cucumbers, and melons in hothouses.

Thinning fruit (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 341–343*).—A general discussion of the subject and the extent to which it should be pursued in different kinds of fruits.

Orchard fertilization, A. S. CHAPMAN (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 313, 314*).—Notes on experiments in using different fertilizers on a sandy soil for the raising of citrus fruits and grapes. Potash fertilizers gave the best results.

Irrigation for the development of fruit, H. A. BRAINARD (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 216–220*).—A discussion of the value of irrigation in fruit raising, and recommendations for its adoption and extension.

Fruit growing in the Santa Maria Valley, O. W. MAULSBY (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 221–223*).—A general discussion of the subject, with a consideration of the soil and climate. Apricots, prunes, English walnuts, peaches, almonds, and cherries are grown in the order given.

Notes on fruit growing at Mildura, A. H. BENSON (*Agl. Gaz. N. S. W., 5 (1894), No. 11, pp. 765–772*).—General notes on the growing of citrus and other fruits in this part of Australia, with remarks on the varieties found best, and on the climate, soil, irrigation, cultivation, and drying of the crops.

Suggestions on horticultural quarantine, A. CRAW (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 290–294*).—General remarks on the subject, laws bearing on it, and its enforcement.

California almonds (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 417–419, pls. 4, fig. 1*).—Descriptive notes on 13 varieties of almonds which are divided into 4 grades, hard shell, soft shell, extra soft shell, and paper shell. A table is given showing the weight of the kernel and shell in a pound of almonds of 12 different varieties, and the relative value of leading California varieties compared with others.

The pistachio (Pistacia vera), G. HEUZÉ (*Jour. Agr. Prat., 59 (1895), No. 4, pp. 143, 144*).

Pecan culture in the arid regions, F. A. SWINDEN (*Irrigation Age, 8 (1895), No. 2, pp. 54, 55, figs. 5*).

Some desirable ornamental trees, shrubs, and plants for planting in Ontario, W. E. SAUNDERS (*Ontario Fruit Growers' Assn. Rpt. 1893, pp. 90–97*).—General remarks on these subjects, with comparative cultural notes on several species of pine, spruces, retinosporas, maples, horse-chestnuts, alders, birches, yellowwood, walnuts, maidenhair tree, oak, false indigo, flowering almond, Siberian pea, dogwoods, mock orange, spiræas, and other trees and shrubs.

FORESTRY.

Five years' experience in planting forest trees, W. A. BUCKHOUT (*Pennsylvania Sta. Rpt. 1893, pp. 153–155*).—Experiments have been in progress to test tree and seed planting at the college grounds and on a small area of wild land. The details of preparation and planting were given in the report of the station for 1888 (E. S. Bul. 2, pt. 2, p. 136). The results have not been wholly satisfactory. The mountain plat proved not well adapted to the purpose, as the undershrubs crowded out that which was planted. The chestnut trees failed entirely in the mountain plat and grew very poorly at the college. A reason for this is that the ground was too loose and permitted the deep taproot to dry out before the lateral roots were developed. The white pine trees at the college made the best growth, averaging 4 to 5 ft. in height. The mountain planting of the same kind of trees gave smaller, weak trees, which are not well established. The principal injury to these trees was done by the pine weevil (*Pissodes strobi*) and the woolly pine louse (*Schizoneura pinicola*).

The author concludes that considering the time, expense, and risk involved, artificial forest planting can not be recommended, at least in the way pursued in the experiment, and that natural methods of reforesting, supplemented by some seed sowing, thinning, and planting, will suffice for the present and the near future.

Experience with evergreens in Pennsylvania, G. C. BUTZ (*Pennsylvania Sta. Rpt. 1893, pp. 142–149, pl. 1*).—A reprint from Bulletin 23 of the station (E. S. R., 5, p. 54).

The long leaf pine and its struggle for existence, W. W. ASHE (*Jour. Elisha Mitchell Sci. Soc., 11 (1894), No. 1, pp. 1–16*).

The planting of beech trees, P. HAUGUEL (*Rev. Hort., 66 (1894), No. 24, pp. 584, 585*).—General notes on this point.

The black walnut in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 12*).

The green ash in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 32*).

The white elm in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 53*).—This tree is recommended as a forest tree for the West on account of its resistant powers and rapid growth.

The New South Wales blue gum, J. H. MAIDEN (*Agl. Gaz. N. S. W., 5 (1894), No. 11, pp. 743–747, pl. 1*).—Illustrated and descriptive and economic notes on *Eucalyptus saligna.*

Notes on the tree flora of Chiricahua Mountains, I, J. W. TOUMEY (*Garden and Forest, 8 (1895), pp. 12, 13*).—An account of a botanical excursion through northern Mexico and southern Arizona.

A descriptive list of the trees of Java, S. H. KOORDERS (*Mededeelingen 'SLands Plantentuin, 1894, No. 12, pp. 175*).

Water and forestry and agricultural production, L. GRANDEAU (*Jour. Agr. Prat., 59 (1895), No. 2, pp. 50–52*).—A brief résumé of the work of Henry Schübler, Schlösing, and Wollny.

Forest conservation, A. KINNEY (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 326–328*).—A general popular article urging the importance of the preservation of forests from destruction and their influence on rainfall. Federal control of forest lands is advocated.

Ringbarking in western New South Wales, T. KIDSTON (*Agl. Gaz. N. S. W., 5 (1894), No. 11, pp. 762–764*).—Notes on removing forests by the employment of this method of deadening the trees. The author does not believe that the destruction of forests lessens rainfall.

Forest fires, W. A. BUCKHOUT (*Pennsylvania Sta. Rpt. 1893, pp. 155–159, fig. 1*).—A reprint from Bulletin 23 of the station (E. S. R., 5, p. 54).

Forest fires in North America, B. E. FERNOW (*Ztschr. Forst. und Jagdw., 17 (1895), No. 1, pp. 31–35*).

Forest fires, causes and preventions (*Forest Leaves, 5 (1895), No. 1, p. 15*).—An abstract from the *Boston Commercial Bulletin*, giving statistics on the subjects, number of fires, acres burned, loss, etc.

Fire and flood, J. T. ROTHROCK (*Forest Leaves, 5 (1895), No. 1, pp. 8, 9, pls. 2*).—An article dealing with the destruction of forests in Pennsylvania and discussing the injury to the soil and property. The plates are from photographs, showing the tracks of forest fires and freshets.

Forest destruction by means of Gryllus campestris and Tettix subulata, ALTUM (*Ztschr. Forst. und Jagdw., 17 (1895), No. 1, pp. 12–17*).

Thirteenth Annual Meeting of the American Forestry Association, B. E. FERNOW (*Forest Leaves, 5 (1895) No. 1, pp. 10, 11*).—A general account of the proceedings of the meeting, with the resolutions adopted favoring forest legislation.

California Forestry Experiment Stations, II, C. H. SHINN (*Garden and Forest, 8 (1895), pp. 62, 63*).—A description of the Santa Monica forestry station.

Forestry in Natal (*Kew Misc. Bul. 97, pp. 1–5*).

SEEDS—WEEDS.

Seed testing, its uses and methods, G. MCCARTHY (*North Carolina Sta. Bul. 108, pp. 347–415, figs. 44*).—The author has brought together from various sources a fund of information relating to the subject of seed testing. The necessity and uses of seed testing are pointed out and a brief review of what has been done in the United States is given, together with a statement of the seed control system of Europe and the methods by which it is conducted. Numerous tables are given showing the viability, genuineness, and value of different kinds of seed. A chapter on the physiology of the seed gives briefly the structure, germination, composition, effect of temperature, light, electricity, and chemicals on germination, specific gravity and volume weight of seed, and the life period of the embryo. In the chapter on practical seed testing are given compiled tables showing the viability, purity, and germination of a large list of forage plants, field and garden crops, and flower seed; the impurities and adulterations of seed and the limits of error in testing, and descriptions of apparatus and methods employed in seed testing. The author has drawn on the various station publications of this country as well as the leading seed control stations of Europe for the facts set forth in this bulletin.

New Mexico weeds, I, E. O. WOOTON (*New Mexico Sta. Bul. 13, pp. 36, figs. 15*).—This bulletin is the first of a series to be devoted to the subject of the weeds of New Mexico, and gives some general information on weed dissemination and repression. The list enumerated embraces 18 species, as follows, the most of which are figured: Nigger

weed (*Sphæralcea angustifolia*), *Sida hederacea*, *Gaura parviflora*, blue weed (*Helianthus ciliaris*), sunflower (*H. annuus*), cocklebur (*Xanthium canadense*), spiny aster (*Aster spinosus*), *Franseria hookeriana*, *Aster canescens*, morning glory (*Ipomœa mexicana* and *I. purpurea*), horse nettle (*Solanum elæagnifolium*), common pigweed or rough amaranth (*Amarantus retroflexus*), rough amaranth (*A. chlorostachys*), low amaranth (*A. blitoides*), lamb's quarter or goosefoot (*Chenopodium album*), sand bur or bur grass (*Cenchrus tribuloides*), *Chloris alba*, and loco weed (*Astragalus mollissimus*).

Western plantain, F. L. HARVEY (*Maine Sta. Rpt. 1893, pp. 157, 158, fig. 1*).—A description and illustrations of *Plantago patagonica aristata* are given, with a report of its appearance in an oat field during the year. The author calls attention to this weed being an annual, and suggests its easy eradication by preventing its setting seed.

The Russian thistle, L. H. DEWEY (*U. S. Dept. Agr., Division of Botany Circular 3, pp. 8, figs 3*).—Popular information is given on the nature, distribution, and remedies for this weed. It is now known to be present in 18 States, and also in 3 of the Canadian provinces.

The sachalin knot weed, L. H. PAMMEL (*Garden and Forest, 8 (1895), p. 67*).—The author refers to 12 years' experience with this plant, and says it spreads very rapidly by means of its rhizomes, and land set in it may have to be given up to it as in the case of the Johnson grass in the South.

DISEASES OF PLANTS.

Some grape troubles of western New York, E. G. LODEMAN (*New York Cornell Sta. Bul. 76, pp. 413–454, figs. 6*).

Synopsis.—The author describes and offers suggestions for the repression of shelling or rattling (a disease of rather uncertain origin), powdery mildew, anthracnose, black rot, brown rot or gray rot, and ripe rot. Brief notes on spraying apparatus and formulas for 3 of the best fungicides are given.

Shelling or rattling (pp. 413–440).—This disease, which although not new was more or less troublesome throughout the grape-growing portions of the State, is characterized by the author as follows:

"The shelling of grapes takes place in the following manner. As the season of ripening approaches, certain berries of the affected clusters fall to the ground on account of the inability of the main fibers and other connecting tissue of the fruit-stems to sustain their weight. . . . The end of the stem is even, as if cut with a knife.

"The portions of the cluster first affected are, so far as my observations go, invariably either the lower extremity of the cluster as it hangs from the cane, or in the case of heavily shouldered clusters, the outer extremity of the stem forming the shoulder. The shelling may begin at both points at about the same time, but it generally makes its appearance first at the lower end of the bunch. Sometimes only one or two berries may fall, but in other cases the drying and shriveling of the stem gradually extends upward, the affected portion being plainly marked by the absence of the berries. It often occurs that not a berry remains hanging upon the bunch. In such cases the ground below the bearing portions of the vine is literally covered with the fallen fruit. . . .

"Some clusters upon a vine seem to be more free from shelling than others upon the same plant. This seems to be due in many cases to its location upon the cane, but there are so many exceptions that no definite rule can be laid down. In general, however, it may be said that of the clusters found upon a certain cane the one which is situated farthest from the main stem of the plant is most seriously affected. . . .

"Another peculiarity which may sometimes be seen, although cases of it are very rare, is the shelling of berries upon only one portion of the vine, as, for instance, those borne upon the canes which spring from an arm, the difficulty thus affecting only one half of the plant. . . .

"It very commonly occurs that plants in certain portions of a vineyard shell, while the large majority of them do not. The line is sometimes so sharply drawn that the affected plant may be entirely surrounded by healthy vines; and it is not uncommon to find a healthy vine in the midst of those which shell. Occasionally the plants in a row are quite different as regards the amount of fruit which is lost, some retaining all, while others lose fully 75 per cent. Such vineyards, however, do not represent the large majority. In these, the shelling is more or less uniform throughout the vineyard, and only in exceptional cases does the loss reach 50 per cent of the crop. The total loss will probably not exceed 5 per cent of the entire yield this year.

"The taste of shelled grapes differs decidedly from that of those remaining upon the upper portion of affected clusters, and still more from that of berries which are borne upon vines in which no shelling takes place. This difference is very noticeable in Concords. Grapes of this variety, when grown under favorable conditions, are sweet and very agreeable to the taste, on account of a flavor which is peculiar to the variety. Shelled grapes are extremely insipid, and are unpalatable, not only from a want of taste but also from a certain disagreeable flavor which, though seldom strong, is still perceptible. Berries which remain upon shelly vines lack flavor, but otherwise they do not appear to possess any particularly disagreeable qualities."

Vines which have shelly grapes are said to be nearly always affected by diseased foliage. This condition usually appearing in July or August, causes the death of the leaf tissues. The leaves on the extremities of the shoots show a yellow coloration more or less following their periphery. Soon the yellow portion turns brown, causing the leaf to curl. In severe cases the brown foliage becomes conspicuous. The shelling is not always accompanied by a decided discoloration, but the two are usually associated. A dark discoloration is often found between the principal veins and is attributed to the same cause as that causing the death of the edges. In some of its aspects this disease resembles apoplexy and rougeot, common in parts of Europe, but the author doubts their identity. In 1890 D. G. Fairchild, of the Division of Vegetable Pathology of this Department, investigated and reported on[1] a disease of grapes probably the same as here described.

The ascribed causes of the shelling are grouped by the author under 4 heads—(1) injuries due to parasites, (2) improper conditions of the vine, (3) conditions of the soil, and (4) conditions of the atmosphere. In considering the various causes the author thinks that insects do not cause the disease, but that fungi may aggravate it, and that the dying of the leaves is a manifestation of the disease. The conditions of the vine, causing the stems to shrivel and the fruit to ripen prematurely probably cause this trouble. Premature ripening of the wood and overbearing weaken the vine and may to some extent cause shelling. Too much wood, due to improper proportion of the elements required for the plant, especially a superabundance of nitrogen, seems to increase the amount of shelling. The kind of soil, not considering the food supply it contains, appears to have no effect, but too much cultivation, by liberating the nitrogenous compounds, aggravates the trouble. Excessive drought and rains influence the amount of disease to some extent. A weak root system has the same effect as overbearing. The disease has been checked by applications of barnyard manure. A lack of phosphoric acid has no effect. In most cases the plants seem to be suffering from a lack of potash, and applications of that fertilizer have been followed by a decrease or disappearance of the disease. Excessive heat and warm winds, by inducing rapid growth, increase shelling, while cool winds or weather checks it. From reports received from quite a number of vineyardists the application of potash to the vines checked shelling, and based on only one year's experience this treatment is recommended.

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[1] Jour. Mycol., vol. 6, p. 96 (E. S. R., 2, p. 455).

Powdery mildew (p. 441).—This disease prevailed to a considerable extent during 1894 in the Chautauqua vineyards. The application of Bordeaux mixture or ammoniacal copper carbonate is recommended as a treatment.

Anthracnose (pp. 442, 443).—This disease has been very severe on Moore Diamond and Brighton varieties, and it is recommended that growers make a trial of the acid sulphate of iron solution, the formula for which is iron sulphate 110 lbs., sulphuric acid 1 qt., water 26 gal.

Black rot, brown or gray rot, and ripe rot (pp. 444–448).—These diseases were somewhat prevalent in certain regions, and the usual fungicides are recommended. The reported failure of some vineyardists to prevent these diseases was due, the author thinks, to too thick foliage and improper application of fungicides. In some vineyards the vines suffered from drought. For these shallow and frequent cultivation is advised.

Spraying apparatus (p. 450).—Different forms of apparatus are described. The knapsack machine is considered the most effective. Hand pumps, the author says, allow of more rapid but less efficient work, while power sprayers are, under favorable circumstances, the most desirable for use in vineyards.

Formulas for fungicides (pp. 450, 451).—Formulas are given, together with directions for preparation for Bordeaux mixture, ammoniacal copper carbonate solution, and acid iron sulphate solution.

Report of botanist, F. L. HARVEY (*Maine Sta. Rpt. 1893, pp. 145, 146, 150, 152–158, figs. 5*).

Synopsis.—The author reports briefly on the fungus diseases occuring during the year, and at greater length on bean anthracnose, tomato anthracnose, potato and beet scab, and western plantain. In addition to the diseases reported on at some length, the following have been more or less prevalent in parts of the State: Pear leaf blight, clover rust, and strawberry septoria.

Bean anthracnose (pp. 152, 153).—This disease, due to the presence of *Colletotrichum lindemuthianum*, has been quite common, attacking both bush and pole varieties of beans, but being most destructive to the white-podded varieties. The disease is described and the following precautions are given for preventing the spread of the disease:

"Select good seed, rejecting all beans that seem at all unsound.

"Should the disease appear in the young beans carefully destroy all affected seedlings.

"If convenient spray early with Bordeaux mixture and repeat the application, if needed, before the pods form.

"Do not plant on ground that has borne an infected crop the past season.

"Plant on a dry soil in hills or in rows far enough apart to admit air freely. Hoe when the ground and foliage are dry."

Tomato anthracnose (pp. 154, 155).—This disease, which caused considerable destruction in the station garden, was described in the Annual Report of the Delaware Station for 1891, p. 60 (E. S. R., 5, p. 591), as *Colletotrichum lycopersici*, but is here called *C. phomoides*. The disease appears on the ripe or nearly ripe fruit, producing discolored, sunken spots with black centers. Successful inoculations have been made, but placing spores on the unbroken epidermis of the tomato failed to produce the disease. A spray of potassium sulphid solution, 7 oz. in 22 gal. of water, together with the destruction of all diseased plants and rotation of crops, are the remedies recommended.

Potato and beet scab (p. 156).—Compiled notes are given showing the identity of these diseases, and the corrosive sublimate treatment is recommended for their prevention.

Miscellaneous botanical work, W. A. BUCKHOUT (*Pennsylvania Sta. Rpt. 1893, pp. 150–153, pl. 1*).—*Experiments for preventing potato diseases* (pp. 150–152).—Experiments were conducted with Bordeaux mixture for the prevention of potato rot with negative results, no blight or rot appearing on any of the plants. The sprayed plants showed a more vigorous appearance of their tops than the unsprayed. The effect of early planting was tried. Plats were planted April 28 and May 7. There was a marked difference in the appearance of the plants until August, when there was little or no appreciable difference. Owing to the hot dry weather of midsummer there was no disease present. When harvested the early plat yielded 1,100 lbs. to 882 from the later planted one. These experiments were to have been repeated in 1893 to see if the same results would be secured, but were overlooked. As the rot does not usually appear until late in July the experiment of early planting is to be investigated further.

Spraying grapes (p. 152).—In 1891 10 varieties of grapes not sprayed were observed, and downy mildew was conspicuous on the Delaware, Brighton, Duchess, Lindley, and Salem varieties. In 1892 the growth of these varieties started very slowly, the Brighton and Duchess vines being nearly dead. Three applications of Bordeaux mixture were given the vines with negative results, there being no mildew that year. In

1893 the experiments were repeated with the same results, and the difference between the sprayed and unsprayed portions of the rows was indistinguishable. A Niagara vine within the sprayed portion showed some black rot, all others being free from the disease. Unsprayed Concord vines produced a full crop free from disease each year.

Leaf spot of beet (pp. 152, 153).—This disease, due to *Cercospora beticola*, was very noticeable. The author thinks spraying would probably prevent it, also that the same result would be secured by a rotation of crops, together with a thorough destruction by fire of all infected leaves upon the ground where grown in such a way as to burn the surface of the ground slightly, destroying the weeds and accumulated rubbish. The injury to the roots is said to be in a direct ratio to the amount of spotting on the leaves.

Wheat scab (p. 153).—This disease is reported as having been more or less abundant, but no experiments were conducted for its repression.

An infection experiment with club root of turnips (finger and toe disease), W. SOMERVILLE (*Jour. Roy. Agl. Soc. England, ser. 3, 5 (1894), No. 20, pp. 808–811, fig. 1*).—The author reports on field experiments with lime for the prevention of club root (*Plasmodiophora brassicæ*) of turnips. The turnips were grown in soil that was not infected in small duplicate plats. The infection was secured by adding to each plat 20 lbs. of soil taken from a field known to be badly infested. Finely ground fresh lime was added to the inoculation soil in ⅛, ¼, 1, and 5 per cent amounts. The lime was ground to such a degree that 90 per cent passed through a number 100 sieve. The yields given were as follows:

Soil inoculation experiment with club root.

Plat.	Infected soil.	Per cent of lime to infected soil.	Number of roots.	Number of diseased roots.	Number of sound roots.	Calculated yield per acre.
	Pounds.					*Bushels.*
1	0	0	42	0	42	354
2	20	0	31	30	1	314
3	20	⅛	38	35	3	421
4	20	¼	33	28	5	374
5	20	1	36	26	10	474
6	20	5	40	4	36	630

The above experiments show the infectious nature of the disease and that it may be greatly reduced by the application of lime to the soil. The author considers an application of about 700 lbs. of finely ground lime equal to an application of 5 tons per acre applied in the usual way. The relative cost and the comparative value of quick and slaked lime are to be subjects for further investigation.

Attacks of Phoma on growing roots, E. ROSTRUP (*Ztschr. Pflanzenkrank., 4 (1894), No. 6, pp. 322, 323*).—The author describes 2 species of *Phoma* that attack root crops of Denmark. The first attacks the kohl rabi and to it the name *Phoma napobrassicæ* has been given. The other, which has been described by the author as *P. sphærosperma*, attacks beet roots. As this name had been preoccupied, the name now given it is *Phoma betæ*. It is thought by the author that this *Phoma* is genetically related to *Sporidesmium putrefaciens*.

Rust in wheat (*Proc. Rust in Wheat Conf., Brisbane, Queensland, 1894, March, pp. 77*).—Progress reports were given by various committees, and the consensus of opinion seems to be that more attention should be paid to the harder wheats, especially those having narrow leaf blades and which are to a considerable degree glaucous, as the most promising rust resistant varieties. Lists are given of what are considered the more resistant varieties, but they vary in different parts of the country represented. Numerous experiments were reported of the ineffectual use of fungicides on the seed before sown. The report concludes with illustrated descriptions of 45 of the more prominent varieties of wheat.

Treatment for sooty mold of the orange, H. J. WEBBER (*U. S. Dept. Agr., Division of Vegetable Pathology Circular 15, pp. 4*).—The sooty mold of the orange, considered by the author as probably due to *Meliola* spp., produces a very marked effect on the tree and fruit. The leaves and fruit are covered by a black soot-like membrane which greatly hinders the processes of assimilation, and the fruit when ripe is small, insipid, and of a very inferior character. In severe cases the trees fail to produce any fruit.

Experiments show that resin washes are very effective remedies in preventing this disease. The formula recommended is resin 20 lbs., caustic soda 4½ lbs., crude fish oil 3 pt., water to make 15 gal. Place the materials in a large kettle with 13 gal. of water and boil until the resin is dissolved, then add water to make 15 gal. This is a stock solution. When used it must be diluted to 150 gal., and will cost about 45 cts. for such an amount. When too strong the wash will burn the fruit, but in the strength here given no injury will follow. The author states that the disease is only serious in its attack when accompanying the white fly or mealy wing, *Aleyrodes citri*. In badly affected groves 3 periods of application must be observed. Beginning the middle of January, 3 applications should be given at intervals of 2 weeks. In May and June is a second period when the trees should be sprayed, and the third period is in August and September. The spray is easily washed off by rain and should be repeated when a rainfall occurs soon after spraying. Thoroughness of application is required, a 14-year-old tree requiring 15 to 20 gal. for each application.

Treatment for potato rot, A. SEMPOLOWSKI (*Ztschr. Pflanzenkrank., (1894), No. 6, pp. 323–325*).—The author conducted experiments on 10 plats of about $\frac{1}{40}$ acre each for the prevention of potato rot. Plats 1, 4, 7, and 10 were untreated, No. 2 was sprayed with a Bordeaux mixture containing 6 per cent copper sulphate and 6 per cent fresh lime; No. 3 was sprayed with a 6 per cent solution of iron sulphate and lime; No. 5 was sprayed with an 8 per cent Bordeaux mixture; No. 6 was sprayed with an 8 per cent solution of iron sulphate and lime; No. 8 was sprayed twice, first with a 4 per cent Bordeaux mixture, and 2 weeks later with a 6 per cent solution of the same; No. 9 was treated in the same way, iron sulphate being substituted for the copper sulphate.

The potatoes were planted April 19 and made their appearance above ground June 7. The spraying was done June 28, and when a second was given it was applied July 12. The potatoes were harvested September 5. The highest yield as well as per cent of starch was found in plat 2, while the number of diseased tubers was small. The smallest yield was from plats 6 and 9, the strong solutions of iron sulphate having injured the plants, its effect being plainly seen in the brownish color of the leaves 6 days after spraying. Plats 8 and 9 showed the lowest per cent of diseased tubers. The most rotten tubers were found in the unsprayed rows. However, the yield and starch content of each of these plats exceeded those of the treated ones with the exception of plat 2. The author establishes the fact that iron sulphate injuriously affects the growth of the leaves as well as lessens the yield of tubers. A comparative test of 2 per cent solutions of Bordeaux mixture and iron sulphate and lime solution is to be undertaken.

Potato scab, S. B. GREEN (*Minnesota Sta. Rpt. 1893, pp. 222–228*).—Reprinted from Bulletin 32 of the station (E. S. R., 6, p. 57).

Late blight and rot of the potato, S. B. GREEN (*Minnesota Sta. Rpt. 1893, pp. 215–221*).—Reprint from Bulletin 32 of the station (E. S. R., 6, p. 57).

A new barley smut, H. BIEDENKOPF (*Ztschr. Pflanzenkrank., 4 (1894), No. 6, pp. 321, 322*).—The author describes as *Ustilago medians* a new species of smut of barley that from cultures seems to be intermediate in its characters between *U. hordei* and *U. jensenii.* A more critical study of the species is to follow.

List of parasitic plants found near the station, O. LUGGER (*Minnesota Sta. Rpt. 1893, pp. 307–312*).—A list of fungi, embracing about 150 species, is given, arranged in the order of their hosts. The more numerous genera represented are as follows: *Peronospora,* 7 species; *Puccinia,* 18 species; *Cercospora,* 10 species, and *Septoria,* 11 species. There are 35 orders of phanerogams represented in the list of hosts.

New species of fungi, J. B. ELLIS and B. M. EVERHART (*Proc. Phil. Acad. Sci., 1894, III, pp. 322–386*).—Descriptions and critical notes on new species.

Diseases of the vine (Cont.), G. MASSEE (*Gard. Chron., 17 (1895), ser. 3, p. 134*).—A brief description of anthracnose (*Sphaceloma ampelinum*) is given. Dusting plants with equal parts of sulphur and lime is advised. Too free use of fresh stable manure is thought to favor the development of the disease.

Chytridiose of the grape and its treatment, A. PRUNET (*Prog. Agr. et Vit., 12 (1895), No. 3, pp. 73–76; No. 4, pp. 91–98*).

Sulphuric acid for grape anthracnose, L. DEGRULLY (*Prog. Agr. et Vit., 12 (1895), No. 6, pp. 135, 136*).—Ten liters of sulphuric acid to 100 of water gave good results when applied to grapes, equaling the acid iron sulphate solution without the trouble and expense of the copperas.

Report on experiments with "Fostite", 1894, W. M. SCHÖYEN (*Tidskr. norske Landbr., 1 (1894), pp. 441–443*).—The Fostite (90 per cent magnesium silicate, 10 per cent copper sulphate) was applied with some degree of success against fungus diseases of potatoes and other crops.

Observations on the application of fungicides and insecticides (*New York State Sta. Bul. 74, pp. 383–405, figs. 12*).—Illustrations and descriptions are given of various kinds of apparatus for the application of fungicides and insecticides, together with formulas for Bordeaux mixture, kerosene emulsion, and Paris green solutions.

ENTOMOLOGY.

Insect Life (*U. S. Dept. Agr., Division of Entomology, Insect Life, vol. VII, No. 3, pp. 217–280, figs. 10*).—*Special notes* (pp. 217–219).—Under this head are treated the need of quarantine laws in the East, the double-broodedness of the codling moth, the chinch bug in 1894, and reviews of entomological publications.

Damage by the American locust, L. O. Howard (pp. 220–229).—An account of a destructive invasion of *Schistocera americana* in Roanoke County, Virginia, where oats, clover, corn, fruit trees, and other vegetation were defoliated by the insects. Illustrated, descriptive, and life history notes are given and a detailed report upon the attack, by D. W. Coquillett, is included. A mixture of bran, arsenic, and sugar distributed through the fields proved an efficient means of destruction.

Chinch bug observations in Iowa in 1894, H. Osborn (pp. 230–232).—Notes on devastations by this insect—wheat, barley, rye, oats, and corn suffering in the order given. The bugs were found in the vast majority of cases to have hibernated in osage orange hedges. Light, friable soils were most infested.

The hibernation of the chinch bug, C. L. Marlatt (pp. 232–234).—Notes and observations on this point of the life history, the normal hibernating place of the chinch bug being believed to be the dense stools of certain wild grasses, which it is recommended be burned in the winter. The life cycle of the insect for central Kansas is summarized.

A maple pseudococcus, L. O. Howard (pp. 235–240).—Illustrated, descriptive, and life history notes on *Pseudococcus aceris*, a rare scale which occurred on maples in 4 or 5 localities in the northern United States the past season.

Notes on cotton insects found in Mississippi, W. H. Ashmead (pp. 240–247).—A continuation of a paper begun in Insect Life, vol. VII, No. 1 (E. S. R., 6, p. 563). This installment contains an annotated list of the Hymenoptera and Coleoptera found in cotton fields by the writer. The following new genus and species are described: *Chrysopophagus, C. compressicornis, Zachresta dimidiata, Limneria mississippiensis, Lymeon annulicornis, Otacustes atriceps*, and *O. chrysopæ*.

The codling moth double-brooded, C. L. Marlatt (pp. 248–251).—An exhaustive review of the data bearing on this point, with the conclusion that in the greater part of the United States the insect has 2 annual broods, though in the northern States there is but 1, and there are 3 in California.

A new sawfly, which is injurious to hollyhocks, T. D. A. Cockerell (pp. 251–253).—A technical description of *Nematoneura malvacearum*.

Notes on Hylesinus sericeus, E. A. Schwarz (pp. 254–256).—Notes on the habits of this scolytid infesting Engelmann's spruce (*Picea engelmanni*) in the Wahsatch Mountains, Utah. An illustration is given of the workings under the bark.

A new parasite of Mytilaspis pomorum, L. O. Howard (p. 256).—Technical description of *Chiloneurus diaspidinarum*, a hymenopterous parasite of the apple oyster-shell bark louse.

The patent on the hydrocyanic acid gas process declared invalid, D. W. Coquillett (pp. 257, 258).—Note on a recent court judgment on this point in California.

A new pear insect (pp. 258–260).—Notes on *Agrilus sinuatus*, a flat-headed borer imported from Europe, that has caused considerable damage to pear trees in New Jersey.

Scorpions, centipedes, and tarantulas (pp. 260–263).—Notes on the venom of these animals, with letters from 2 entomologists who had been stung by scorpions in the Tropics.

General notes, and notes from correspondence (pp. 263–280).—Among these may be noted the following: Grain insects in mills, the carnation twitter again, legislation against insects in British Columbia, a new department of the Pasteur Institute, some South Australian matters, coöperative work against insects, a New Zealand moth-catching plant, the army worm in 1894, abundance of *Charæas graminis* in Scotland, two more important Vedalias, damage by the brown sap chafer, abundance of an imported snout beetle in Maine, damage to clover in Michigan, a new cotton insect in Texas, the pear midge in England, destructive grasshoppers in New York, an important scale insect on cottonwood, the spider which bites, cicada chimneys, bird lice as mutualists, occurrence of the pear-leaf blister mite upon the Pacific Coast, maggots in poor butter, new habitats for the Florida red scale, the potato-scab gnat in Missouri, Oklahoma food of the harlequin cabbage bug, the apple maggot in North Carolina, the sugar-cane weevil in the Fiji Islands, horn fly on horses again, the barnacle scale in Louisiana, and the hen flea on horses.

Report of the entomologist, F. L. HARVEY (*Maine Sta. Rpt. 1893, pp. 146–151, 159–180, figs. 16*).—Illustrated, descriptive, life history, and remedial notes on the Angoumois grain moth (*Gelechia cerealella*), lime-tree winter moth (*Hybernia tillaria*), apple-leaf bucculatrix (*Bucculatrix pomifoliella*), disippus butterfly (*Limenitis disippus*), May beetle (*Lachnosterna fusca*), bean weevil (*Bruchus obtectus*), pear-blight beetle or shot-borer (*Xyleborus pyri*), and carrot fly (*Psila rosæ*).

The apple-leaf bucculatrix was observed damaging apple trees in the State for the first time, and its habits were especially investigated. The damage was done in early summer and it is believed that there is but one brood in Maine. Jarring the larvæ from the trees, spraying with kerosene emulsion in the winter and when the larvæ hatch, and hand picking the cocoons are recommended. Kainit, kerosene emulsion, and turning hogs in infested fields are suggested against the larvæ of the May beetle. The bean weevil was quite injurious, and it is suggested that infested seeds be thrown into hot water for a few minutes or heated to 145° F. for an hour. Bisulphid of carbon is also suggested. The pear-blight beetle was noticed for the first time attacking fruit trees, it having previously been noticed only on forest trees. It is recommended that blighted twigs or limbs be cut off promptly and burned. The larvæ of the carrot fly were found burrowing in barrels of carrots. Treating the infested roots with hot water is advised. Pouring kerosene emulsion along the rows of plants during the growing season it is thought may be advantageous.

Gas treatment for destroying scale insects on citrus trees, A. CRAW (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 105-109, pls. 2*).—Directions for the preparation of hydrocyanic acid gas and its application, the manufacture of the tents and other apparatus being detailed. It is advised that the tents be treated with a light coat of linseed oil, or, better, with a watery extract of the common prickly pear cactus (*Opuntia engelmani*) combined with glue and ocher or Venetian red.

Experiments were made in spraying apple trees with a solution of Paris green and Bordeaux mixture as a combination remedy against codling moth and apple scab.

Beneficial insects, A. CRAW (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 96–105, pls. 3*).—Descriptive notes and colored illustrations of the following insects, native and imported, preying upon various scale insects: Two-spotted ladybird (*Adalia bipunctata*), *Anatis subvittata*, twice-stabbed ladybird (*Chilocorus bivulnerus*), ashy-gray ladybird (*Coccinella abdominalis*), California ladybird (*C. californica*), 22-spotted leis (*C.* (*Leis*) *conformis*), eyed ladybird (*C. oculata*), blood-red ladybird (*C. sanguinea*), Julian's banded ladybird (*C. trifasciata juliana*), Pilate's ladybird (*Exochomus pilatei*), convergent ladybird (*Hippodamia convergens*), ambiguous ladybird (*H. ambigua*), *Hyperaspis lateralis*, striped ladybird (*Megilla vittigera*), Koebele's ladybird (*Novius koebelei*), six-spotted orcus (*Orcus australasia*), steel-blue ladybird (*O. chalybeus*), 20-spotted ladybird (*Psyllobora 20-maculata*), brown-necked ladybird (*Rhizobius toowoombæ*), black ladybird (*R. ventralis*), Australian ladybird (*Vedalia cardinalis*), a lepidopterous enemy of the black scale (*Thalpochares coccophaga*), lace-winged fly (*Chrysopa californica*), brown lace-winged fly (*Hemerobius*), spine-legged soldier bug (*Sinea spinipes*), gray soldier bug (*Euschistus tristigmus*), and syrphus fly (*Catabomba pyrastri*).

Entomology and quarantine, A. CRAW (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 79–90, figs. 3*).—A report of the inspection of steamers and their cargoes to avoid the introduction of injurious insects. Details of the work of fumigation are given. Notes are included on some of the beneficial insects of the State, chiefly ladybirds, and on some of the injurious insects and their parasites. Descriptive and remedial notes are given.

The silk industry, FRY and JAMES (*Agl. Gaz. N. S. W., 5 (1894), No. 11, pp. 812–817*).—A general article to show that the industry could flourish in Australia.

Note on Pulex pallidus and Sarcopsylla gallinacea, from Transcaspia, J. WAGNER (*Hor. Soc. Ent. Ross., 28 (1894), No. 3 and 4, pp. 440–443*).—Gives description and figures of the chicken flea from specimens found on owls in Middle Asia. The species is identical with that occurring in Florida.

On a new species of Ixodidæ from Congo, J. MARTIN (*Ann. Sci. Nat., 18 (1894), 2d ser., pp. 267–277, pl. 1*).—This contains a description of *Amblyomma quantini* and a partial bibliography of *Ixodidæ*.

Furniture beetles, S. L. MOSLEY (*The Naturalists' Journal, 4 (1895), No. 31, pp. 14, 15*).—Ravages of *Anobium domesticum*, *Xertobium tesselatum*, and *Ptilinus pectinicornis* in the wood of furniture, etc. Paraffin is recommended as a remedy.

Scale insects, A. CRAW (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 90–96, figs. 8*).—Descriptive and life history notes on an elm scale (*Gossyparia ulmi*), depressed scale (*Lecanium depressum*), pine tree scale (*L. insignicolla*), black scale (*L. oleæ*), orange chionaspis (*Chionaspis citri*), long scale (*Mytilaspis gloverii*), and purple scale (*M. citricola*). Against the elm scale a resin wash is recommended in the winter and kerosene emulsion in the spring and summer. Formulas are given for the preparation of these insecticides.

Observations on Physapoda in the summer of 1893, F. TRYBORN (*Ent. Tidskr., 15 (1894), No. 1 and 2, p. 41*).

The red gooseberry mite (Bryobia nobilis), F. THOMAS (*Whittmark's Gartenflora, 43 (1894), pp. 488–490*).

Injury to gooseberry plants by Bryobia ribis, F. THOMAS (*Mitt. Thür. Bot. Ver., 2d ser., 6 (1894), pp. 10, 11*).

The oviposition of Melitara prodenialis, H. G. HUBBARD (*Proc. Ent. Soc. Wash., 3 (1895), No. 3, pp. 129–132*).—Description and figure of the peculiar mode of oviposition of this moth, which is greatly destructive to cultivated cacti.

Treatment of vines infested with phylloxera with mulches of peat impregnated with schists, F. DE MÉLY (*Compt. Rend., 120 (1895), No. 2, pp. 67–69*).

Legislation against plant pests, C. S. SARGENT (*Garden and Forest, 8 (1895), No. 362, pp. 40, 41*).

"Insect Lime," J. B. SMITH (*Ent. News, 1895, Feb., pp. 46, 47*).—Recommends it for protecting fruit trees.

On an Acarien parasite of Lampyris splendidula, A. GRUVEL (*Compt. Rend., 120 (1895), No. 3, pp. 161, 162*).

The use of parasitic and predaceous insects, C. M. WEED (*Amer. Nat., 29 (1895), No. 337, pp. 69, 70*).

Rhizobius ventralis, B. M. LELONG (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 426–432*).—An article on the introduction of the black ladybird. Extracts from letters of horticulturists in various parts of the State are included, testifying to the value of the ladybird in destroying the black scale.

Beneficial insects, A. KOEBELE (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 145–150*).—General notes on some of the natural parasites of coccids injurious to fruit trees in Australia, with notes on their habits, some of the scale insects, and the condition of fruit growing in that country.

Report of the government entomologist of Sweden for the year 1893, S. LAMPA (*Ent. Tidskr., 15 (1894), No. 1 and 2, pp. 1–40*).

The classification of insects and their relation to agriculture, O. LUGGER (*Minnesota Sta. Rpt. 1893, pp. 75–143, figs. 81*).—A reprint of Bulletin 28 of the station (E. S. R., 4, p. 932).

On economic entomology and mycology in the United States and what we can learn therefrom, M. HOLLRUNG (*Jahrb. deut. landw. Ges., 9 (1894), pp. 60–70*).

FOODS—ANIMAL PRODUCTION.

Analyses of cattle foods, W. H. JORDAN, J. M. BARTLETT, and L. H. MERRILL (*Maine Sta. Rpt. 1893, pp. 25–36*).—This includes studies on the composition of corn fodder and silage from different varieties, the comparative composition of large Southern corn and the smaller Maine field corn, the influence of maturity upon the composition of the corn plant, the constituents of the nitrogen-free extract, and the effect of slow drying upon a sample of a succulent plant (p. 744).

Observations have been made for 5 years on the composition of large Southern corn and of the smaller native corn grown in Maine. The latter matures, but the former has to be cut when immature. The average composition of the dry matter of the 2 varieties is given as follows:

Composition of the dry matter of 2 varieties of corn.

Average for 1892 and 1893.	In 100 parts water-free substance.				
	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Southern corn, immature	7.76	11.72	27.70	50.54	2.28
Maine field corn, mature	6.05	10.94	19.79	60.33	2.89
Differences	+.71	+.78	+7.91	—9.89	—.61

"The Maine field corn, which reaches maturity, contains the larger percentage of dry matter. . . .

"The dry substance of the larger and immature corn contains more ash, protein, and fiber and less nitrogen-free extract and fat. The much larger percentage of fiber and greatly less percentage of nitrogen-free extract are the noteworthy differences."

The Maine field corn was cut at 5 different dates from August 15 to September 21 and samples of each cutting analyzed. These analyses show that as the corn approaches maturity there is a continuous and large increase in the percentage of dry matter, due principally to an increase in nitrogen-free extract. To determine if possible what components were responsible for this increase in nitrogen-free extract determinations were made of the starch by means of diastase and the acid method and of the sugar. These showed "that while a decrease in sugar occurred with the maturing of the ear, this was much less than the corresponding increase of starch, so that maturity shows a large excess over any other period of the more valuable carbohydrates."

A comparison of the starch and sugar in immature Southern corn and mature native corn, both grown in Maine, showed the following:

Sugars and starch in the immature and mature corn plant.

	Parts in 100 of water-free substance.				Parts of sugars and starch in 100 parts of nitrogen-free extract.
	Sugars.	Starch.	Total sugars and starch.	Total nitrogen-free extract.	
Southern corn, immature, no ears, 4 samples	12.85	1.07	13.92	50.55	27.5
Maine field corn, mature, full ears, 4 samples	13.32	14.02	27.34	60.33	45.3
Excess in the Maine field corn	0.47	12.95	13.42	9.78	17.8

"There is a constant and striking difference between the percentages of starch in the Southern corn and in the Maine field corn. They are much larger in the latter kind. This is due undoubtedly to greater maturity. Only a small amount of starch appears to be deposited in the stalk and leaves, its rapid formation and storage in the plant apparently not beginning until the later development of the fruit or kernels."

The digestibility of the pentose carbohydrates, W. E. STONE and W. J. JONES (*Maine Sta. Rpt. 1893, pp. 44–56*).—This is a reprinted article,[1] and relates to the study of the pentose carbohydrates in a large number of feeding stuffs fed in digestion trials at the Maine Station and in the feces from the same.

"The grasses make the largest showing, but in the majority of samples the pentosans amounted to from 20 to 30 per cent of the non-nitrogenous extractive matter. . . .

"The data for the pentosans in feces of sheep, excluding the data for *Calamagrostis canadensis*, which evidently present something anomalous, shows 58.2 per cent of pentosans to have been digested and 41.8 per cent undigested.

"These results are worthy of consideration. Twenty of the best known food stuffs for cattle are here shown to contain a minimum of from 6 to 16 per cent of their dry weight in pentosans, of which an average of only 58.2 per cent is found to be digestible. It appears, then, that while these bodies are to be for the present classified among the carbohydrates, they are really much less digestible, and hence of less food value, than the better known members of this group, such as starch, sugar, etc. In many cases the indicated digestibility is even less than that assigned to the fiber of the same materials, and the average of all the experiments is but little higher than the corresponding average for the fiber."

Effect of slow drying upon a sample of a succulent plant, W. H. JORDAN, J. M. BARTLETT, and L. H. MERRILL (*Maine Sta. Rpt. 1893, pp. 35, 36*).—A sample of about 500 lbs. of field corn was chopped fine and spread out on a scaffold to dry, and a subsample was taken and dried rapidly in a steam closet in the laboratory. Analyses of the rapidly and slowly dried samples are given.

"It seems that for each 100 lbs. of green corn 3.58 per cent of dry matter was lost in the process of slow drying under the most favorable circumstances. This was 14.13 per cent of the total dry matter in the fresh plant, which means that of each 100 lbs. of dry substance originally in the plant only 85.87 lbs. were saved.

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[1] Agl. Sci., 7 (1893), No. 1, p. 6.

"It is interesting to note that this loss falls almost entirely on the nitrogen-free extract, or carbohydrates, more than two thirds of it being actually accounted for by the diminished percentage of sugars."

Effect of watering, whether before or after eating or ad libitum, on digestibility of the food and nitrogen exchange, S. GABRIEL and H. WEISKE (*Landw. Vers. Stat., 45, No. 3 and 4, pp. 311–323*).—To determine whether it was immaterial when animals were watered, as shown by the amount of water taken, the utilization of the food, and the nitrogen exchange of the body, a trial was made with 2 grown sheep, lasting from June 2 to 29, divided into 3 periods. In the first period water was kept before the sheep all the time; in the second No. 1 was watered before feeding and No. 2 after; and in the third the order was reversed. The food consisted uniformly of 800 gm. of meadow hay and 250 gm. of whole oats per sheep daily, fed in 3 portions. The quantity of water drunk and the amount and composition of the solid and liquid excreta were determined for each sheep in each period. The average results follow:

Average water consumption, nitrogen exchange, and nitrogen storage per sheep daily.

Manner of watering.	Amount of water drunk.		Nitrogen exchange of body.[1]		Nitrogen stored in body.	
	No. 1.	No. 2.	No. 1.	No. 2.	No. 1.	No. 2.
	Cc.	*Cc.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*
Ad libitum	1,804	2,333	7.34	8.21	1.59	1.22
Before feeding	1,596	1,765	7.88	8.18	1.00	1.30
After feeding	1,870	2,127	7.89	8.26	1.27	1.38

[1] As shown by nitrogen in urine.

Digestibility of ration under different methods of watering.

Manner of watering.	Protein.		Fat.		Fiber.		Nitrogen-free extract.	
	No. 1.	No. 2.	No. 1.	No. 2.	No. 1.	No. 2.	No. 1.	No. 2.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Ad libitum	57.37	60.55	63.59	65.96	61.73	53.48	66.78	68.52
Before feeding	57.04	60.89	65.98	66.88	52.90	60.26	66.14	64.17
After feeding	58.85	61.94	64.33	66.33	57.89	59.54	65.44	67.15

It will be seen that sheep No. 1 invariably drank more water than sheep No. 2, which is believed to be a matter of individuality. Both sheep drank less water when it was given before feeding than when given *ad libitum* or after feeding. The average difference amounted to 13 per cent with No. 1 and 21 per cent with No. 2. There was no apparent connection between the manner of watering and the nitrogen exchange, although this was somewhat greater throughout in the case of No. 2, due, it is suggested, to the greater water consumption. Likewise in the rate of digestibility there were no regular differences that could be attributed to manner of watering.

The conclusion is reached that under the conditions here prevailing there is no difference in the rate of digestibility of the food, production, etc., whether the animals are given water *ad libitum* or before or after eating.

Digestion experiments, W. H. JORDAN (*Maine Sta. Rpt. 1893, pp. 38–43*).—The results are given of digestion trials with sheep on Southern corn fodder, field corn fodder, sweet corn fodder, Southern corn silage, and field corn silage. No data are given except the composition of the materials as fed and the digestion coefficients found. The latter were as follows:

Digestion coefficients of corn fodder and corn silage.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Southern corn fodder, 1891	61.3	62.8	43.1	63.4	65.7	61.0	59.0
Field corn fodder, 1891	72.7	74.2	50.7	67.6	78.6	73.8	64.7
Sweet corn fodder, 1891	70.9	72.7	44.0	71.5	74.6	73.1	77.0
Southern corn silage, 1892	64.4	65.8	48.2	64.8	66.7	65.4	67.8
Field corn silage, 1892	78.0	80.2	41.3	68.0	77.9	83.1	80.9
Do	76.0	77.9	36.6	73.3	77.8	78.5	80.9
Field corn fodder, 1893	69.8	71.4	54.5	70.4	72.3	71.3	67.3
Do	69.7	73.6	20.0	68.6	70.7	76.7	73.7

During the past 4 years 37 digestion trials have been made at the station on corn fodder and corn silage. The results of these are compared with the digestion coefficients for timothy hay, wheat bran, and corn meal.

"These figures show beyond question that corn fodder well preserved and corn silage have a high digestibility as compared with hay. To this fact should be attributed in large measure undoubtedly the great favor with which the corn plant, as now preserved in the silo is regarded by dairymen as milk-producing food. What has been supposed by many to be due to the peculiar influence of the fermentations in the silo, should more properly be credited to the superior food properties of the plant which the silo conserves so efficiently, and which would be equally valuable when preserved as completely in any other manner."

A comparison is also made of the digestibility of the fodder and silage from native field corn and from Southern corn grown in Maine. The comparison is as follows:

Comparative digestibility of 2 varieties of corn grown under similar conditions.

	Dry matter.	Organic matter.	Ash.	Protein.	Fiber.	Nitrogen-free extract.	Fat.
Field corn fodder and silage, 7 samples, 17 trials	72.3	74.6	36.8	65.1	76.5	75.5	74.9
Southern corn fodder and silage, 5 samples, 12 trials	64.6	66.5	39.7	59.6	71.0	65.2	66.3
Difference in favor of the field corn	7.7	8.1	....	5.5	5.5	10.3	8.6

"It is certainly a matter of some importance to Maine farmers that the smaller variety of corn, which matures in this latitude, should prove to be more digestible to the extent of about 8 per cent of the total dry matter.

"The nitrogen-free extract appears to show a greater difference of digestibility than other portions of the plant, and it is here that we must look for at least a partial explanation of the fact under discussion. . . .

"Several examinations of the feces in these experiments have failed to show the presence of sugars or starch, the diastase test being employed for the latter. These carbohydrates being entirely soluble in the digestive fluids, as it was reasonable to expect, their presence in these foods in greatly varying quantities must certainly cause corresponding variations in the digestibility of the nitrogen-free extract, and consequently of the total dry matter, other things being equal. That this is so is easily seen from the figures presented."

Steer feeding, A. A. MILLS (*Utah Sta. Bul. 35, pp. 23*).—Three lots of 4 steers each were fed alike on mixed hay from November 29 to December 20. From then until April 11 lot 7 had mixed hay alone; lot 8, hay with straw, alfalfa, or clover, and 3 lbs. grain per head for 1 month; and lot 9 had hay and 3 lbs. grain (bran, wheat, and barley) per head daily. In the finishing period, April 11 to May 16, all received alike 3 lbs. of grain (bran and wheat) per head, 10 lbs. roots, 3 lbs. straw, and hay *ad libitum.*

The steers were kept in yards with open sheds. The gains in weight, food eaten, and financial results are tabulated. From November 29 to April 11, lot 7 (mixed hay) gained 574 lbs. in all; lot 8, 270 lbs., and lot 9 (hay and grain), 252 lbs. During the final period lot 7 gained 39 lbs.; lot 8, 11 lbs., and lot 9, 91 lbs. For the whole trial the average cost of food per pound of gain was 7.2 cts. for lot 7, 10.71 cts. for lot 8, and 8.51 cts. for lot 9. With steers at 2½ cents per pound there was a loss with all the steers, which was least with lot 9.

Steers fed moderately well for 12 weeks.—Six lots of 3 steers each which had been used in an experiment with alfalfa, reported in Bulletin 31 of the station (E. S. R., 6, p. 203), were fed from February 21 to May 16 variously on hay with silage, roots, or straw, and 4 lbs. of grain per head daily; or hay and roots with 4, 6, or 8 lbs. of grain. The grain was a mixture of bran, barley, and wheat. The coarse fodder was fed *ad libitum.* The gains, food eaten, and financial results are tabulated.

"Of the 3 sets of steers fed either roots, silage, or straw as an appetizer, those fed the roots gained most, with straw second and silage third.

"Of steers fed 4, 6, and 8 lbs. of grain per day, respectively, the gain increased as the amount of grain fed was increased; the cost of the daily ration increased likewise; while the cost of 1 lb. of gain decreased as the amount of grain fed increased."

Feeding experiments with cows, W. H. JORDAN (*Maine Sta. Rpt. 1893, pp. 66–82*).—*Relative feeding value of Southern corn silage and Maine field corn silage* (pp. 66–73).—The object of this experiment was to compare silage from native Maine corn and from large Southern corn grown in Maine. Five cows were fed in 3 periods of about 1 month each. In the first and last periods about 40 lbs. of Southern corn silage was fed per day, and in the second period about 30 lbs. of native corn silage. The other foods consisted of corn meal, bran, gluten meal, and cotton-seed meal, with barley hay in the first 2 periods and timothy hay in the last. The digestible food material in the daily ration of the 3 periods was 14.23, 16, and 14 lbs., respectively. The analyses of the feeding stuffs given, the amount of nutrients consumed, weight of cows, and the yield and composition of the milk are tabulated.

"The cows lost from 15 to 30 lbs. weight in passing from the first to the second periods, and this loss was partially regained during the third period. These changes in live weight can be readily explained by the less weight of silage eaten in the second period, with no marked change in the quantity of water drank in any period. . . .

"When we see that in the second period of this experiment practically the same weight of milk was produced, and that owing to an increase in the dry matter of the milk there was actually a larger production of milk solids, we have good presumptive evidence that the ration containing the 30 lbs. of [native] field corn silage was more efficient than the previous ration containing 40 lbs. of Southern corn silage. This evidence is strengthened by the fact that when in the third period a return is made to the Southern corn silage the yield of milk solids is decidedly diminished.

"[The indications are] that, pound for pound, the Maine field corn silage was worth more than the Southern corn silage, and that the difference was practically in the proportion of the amount of digestible dry substance in the 2 materials. This is the result which a careful consideration of the facts learned in other ways would lead us to expect."

The influence of widely differing rations upon the quantity and quality of milk (pp. 73–82).—An experiment is reported with 3 cows, covering 3 periods of 35 days each, in which the following rations were compared:

Ration 1:

Timothy hay	*ad lib.*
Corn meal	2 pounds.
Cotton-seed meal	2 pounds.
Gluten meal	2 pounds.

Ration 2:

Timothy hay	*ad lib.*
Corn meal	6 pounds.

Cow A received ration 1 during the first and third periods and ration 2 during the second period, and cows R and L T received ration 2 during the first and third periods and ration 1 during the second period. The nutritive ratio of ration 1 was 1 to 6.7, and of ration 2, 1 to 12.3. Both rations furnished practically the same amount of digestible material. The amounts of food eaten and the yield and composition of the milk, melting point, volatile acids, and iodin equivalent of the butter are tabulated for each cow. The yield of milk and of milk solids was as follows:

Yield of milk and milk solids on nitrogenous and carbonaceous rations.

	Daily yield of milk.			Daily yield of milk solids.		
	Nitrogenous ration.	Corn-meal ration.	Excess with nitrogenous ration.	Nitrogenous ration.	Corn-meal ration.	Excess with nitrogenous ration.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Cow A	25.6	20.0	5.6	3.61	2.68	0.93
Cow R	20.7	15.2	5.5	2.88	2.07	0.81
Cow L T	19.1	15.6	3.5	2.72	2.10	0.62

"The cows did not vary greatly in body weight, but their general appearance showed less thrift while being fed the corn-meal ration.

"The yield of milk from the nitrogenous ration was from one fifth to more than one third larger than that from the corn-meal ration, the excess ranging with the 3 cows from 20 per cent to 36 per cent, or an average of about 5 lbs. of milk per day.

"In general the milk was materially richer while the cows were fed the ration rich in protein, though with one cow it showed the largest percentage of solids during the third period while she was eating the corn-meal ration. With the other two cows the influence of the mixture of cotton-seed meal, gluten meal, and corn meal in increasing the per cent of solids of the milk seemed quite marked.

"The daily yield of milk solids was from 30 to 40 per cent greater with the more nitrogenous ration.

"The composition of the milk solids seemed to be independent of the ration. In general the proportion of fat increased throughout the experiment without regard to what the cows were fed, and no evidence is furnished in support of the notion that by changing the food it is possible to produce more butter fat without an accompanying increased production of the other milk solids. In other words, it appears that the most profitable food for butter production will also be most profitable for the milk farmer or cheese maker. The relation of fat to the other solids seems to be determined by the animal or by certain unknown conditions of environment rather than by the food.

"So far as could be learned by chemical tests, the butter made from the 2 rations was not greatly different."

Dairy herd record for 1892, T. L. HAECKER (*Minnesota Sta. Rpt. 1893, pp. 313–324*).—A record for the year of 27 cows, including Jerseys, Guernseys, Holsteins, Polled Anguses, Shorthorns, and grades. This shows for each cow the date of calving, change in weight, monthly yield and composition of milk, and monthly and yearly yields of butter.

"The fat for the entire herd ranged from an annual average of 3.34 to 6 per cent. This marked difference is clearly a breed characteristic. . . .

"While there is a general tendency for the milk to grow richer in fat as the period of lactation advances, this change is not as great or as uniform as is generally supposed. [The individual records for January, March, June, and July show that] in January the daily average in milk of the 17 cows amounted to 423 lbs.; in March it shrunk to 354.3 lbs.; while in June, when the cows were in pasture, it increased to 375 lbs., and in July, when pastures began to be dry, there was again a shrinkage to 301.6 lbs., showing that the succulent food in June materially increased the flow of milk. In January the average per cent of fat in the milk was 4.55, in March it rose to 4.95, and in June it dropped to 4.49; that is, after the expiration of 6 months the average per cent of fat was less by 0.06 per cent, showing that feed exercised a greater influence in the per cent of fat than did the advanced period of lactation. The fact that the per cent of fat in July, when the Kentucky blue grass, of which the pasture was composed, was dry, rose to 4.81, gives additional evidence that the variation in the fat was largely due to feed influences. .

"[The butter fat record] shows a gradual decrease in the amount of fat, as the period of lactation advances, and also shows that this shrinkage takes place very slowly and gradually when cows are of the proper dairy breeding type. . . .

"Comparing the annual butter yield with the live weight, the registered Jersey, Pride, is in the lead, making 0.46 lb. of butter for every pound of live weight, followed by the grade Jersey, Marie, with 0.44; the grade Guernsey, Olive, 0.44; the grade Jersey, Beckley, with 0.43; then Sweet Briar, Rose, and Rossie, 0.40 lb. each. . .

"Our best cows, the annual butter product of which exceeds 40 per cent of the live weight, are small or medium in size, though good ones are found among the larger."

Feeding experiments with pigs, W. H. JORDAN (*Maine Sta. Rpt. 1893, pp. 82–95*).—These experiments include comparisons of breeds and a comparison of skim milk, pea meal, and corn meal with a mixture of equal parts of pea meal, oat meal, and corn meal on 3 different breeds of pigs. The relation of the food to growth in different breeds is shown in the following summary:

Relation of food to growth in pigs (digestible organic material for each pound of gain).

Experiment.	Cheshire.	Poland China.	Yorkshire.	White Chester.	Jersey Red.	Berkshire.	Tamworth.	Tamworth-Berkshire.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
1890	2.88	2.73	2.50	2.50		2.45		
1891	3.12			2.78	2.93			
1891-'92, early growth							3.18	2.48
1891-'92, later growth							3.71	2.89
1892, period 1						2.36	2.11	2.03
1892, period 2						3.80	3.20	3.20
1892, period 3						5.87	4.03	3.52
1892, period 4						3.80	4.19	4.02
1892, average 4 periods						3.40	3.21	3.00

"These experiments furnish no evidence of the superior producing capacity of any one of the breeds tested. . . . It is certainly true of the Tamworth-Berkshire cross that the animals were finely formed and vigorous, and they certainly used food more economically than either the pure bred Tamworths or Berkshires. This cross has been admired by all who have seen it, and the market quality of their carcasses was highly commended.

"[The butcher's analysis of the carcasses] do not warrant the claim that any one of the breeds compared possesses superior market qualities over all the others. The Tamworth's gave a somewhat larger percentage of lean cuts and the Tamworth-Berkshire cross a larger proportion of salting pork. The differences are small, we may believe, compared with those which may be caused by age, food, or individual variations."

In a comparison of the dry matter of skim milk with the digestible matter of pea meal 2 lots of pigs were selected from the same litters and fed rations composed of skim milk, pea meal, and corn meal, or rations in which pea meal or oat meal was made to take the place of skim milk in the proportion of digestible substance in the two. The rations contained practically the same amounts of digestible matter. Tamworths, Berkshires, and Tamworth-Berkshires were represented.

"It is very plain that for young pigs the rations containing skim milk proved superior to those containing the nitrogenous vegetable foods as a substitute. But with the older animals the substitution of pea meal or pea and oat meal for the skim milk, wholly or in part, did not materially change the rate of growth or its relation to the digestible food consumed.

"In a single case an exception occurs, viz: Period 3 with the Berkshires in the 1892 experiment, where the pure grain ration seemed to check the growth of the pigs. In all other cases the amount of digestible food seems to be the practical measure of efficiency, whether its source be animal or vegetable."

Relative value of corn and oats for horses, A. A. MILLS (*Utah Sta. Bul. 36, pp. 12*).—Two teams of work horses were divided into 2 lots, one horse for each team being in each lot. Fifteen pounds of mixed hay and 3 lbs. of wheat or bran per head were given to the horses in both lots, and those in one lot received 6 lbs. of corn, while those in the other lot received 6 lbs. of oats per head. The grain was ground and mixed before feeding. The trial lasted from April 18 to September 26, and the rations were reversed several times during the trial. Grouping the changes in weight according to the kind of feed, "It will be seen that those on the oat ration lost 47 lbs., while those on the corn ration gained 29 lbs., thus favoring the corn ration by a total of 76 lbs. . . . The corn contained 323.77 lbs. more digestible matter than did the oats. This is just about sufficient to account for the excess of gain of the corn-fed lot over the oat-fed."

Reference is made to previous experiments bearing on this subject published in the Annual Report of the station for 1892 and Bulletin 30 (E. S. R., 5, p. 77, and 6, p. 240).

"To sum up the 3 experiments, we find: First, that during the summer corn and timothy were not so good as oats, wheat, and clover in maintaining the weight of horses; second, that during the winter corn and timothy did as well as oats, clover, and timothy in maintaining the weight of horses; third, that during the spring and summer corn, wheat, or bran and mixed hay produced more gain than oats, wheat, or bran and mixed hay."

The effect of different acids on pepsin digestion, M. HAHN (*Virchow's Arch. path. Anat. und Physiol., 137, pp. 597–604; abs. in Chem. Centbl., 1894, II, No. 14, p. 618*).—The effect of sulphuric, nitric, phosphoric, boracic, oxalic, citric, and tartaric acids was compared with that of hydrochloric acid, in a 0.281 per cent digestive solution, on the following substances: (1) Albumen solution, prepared by neutralizing egg albumen with dilute hydrochloric acid; (2) moistened fibrin; (3) dry fibrin; and (4) coagulated egg albumen.

The results showed that the acids employed had different effects, but that the hydrochloric acid was the most advantageous in the digestion of albuminoids. The organic acids taken as a whole were less effective in digestion than the inorganic acids. Only in the case of fibrin were tartaric and oxalic acids of value. The order of effectiveness of the mineral acids on albumen solution was hydrochloric acid, nitric acid, sulphuric acid, and phosphoric acid. When moistened fibrin was used phosphoric acid stood at the head. The boracic acid was of no value to digestion, which was to be expected. It gives insoluble precipitates with most albuminoids, and, like all antiseptics, retards the action of the ferments. As a practical result of these studies it follows that phosphoric acid is best fitted to take the place of hydrochloric acid in pepsin digestion. Although this had only weak effect on the albumen in solution, which forms the smaller part of our food, it had a noticeable effect in the case of solid albuminoid bodies.

Foods, nutritive value and cost, W. O. ATWATER (*U. S. Dept. Agr., Farmers' Bul. 23, pp. 32*).—This is a popular bulletin dealing with the nutrition of the human body, the composition and fuel value of food, nutritive value of different food materials, digestibility of food, dietaries and dietary standards, pecuniary economy of food, waste of food, and food and health. An appendix gives the composition of a large number of food materials, dietary standards, and 18 suggested dietaries with their composition.

Chemical composition of foods, E. F. LADD (*North Dakota Sta. Bul. 15, pp. 49-61*).—Analyses with reference to feeding value are given of timothy, orchard grass, Kentucky blue grass, mixed grasses, prairie hay, millet, medium red clover, alsike clover, alfalfa, wheat straw, oat straw, corn silage, oats, wheat, wheat screenings, wheat bran, linseed meal, and sedge seed; and analyses with reference to fertilizing ingredients of timothy, orchard grass, Kentucky blue grass, medium red clover, alsike clover, and alfalfa.

The composition of fodders, wheat, and milled products, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 41-49*).—A reprint from Bulletin 27 of the station (E. S. R., 4, p. 733).

Stock feeding, H. P. ARMSBY (*Pennsylvania Sta. Rpt. 1893, pp. 13-24*).—This is a popular article on the principles of scientific feeding, composition of feeding stuffs, feeding standards, etc.

Digestion experiments, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 3-40*).—A reprint of Bulletin 26 of the station (E. S. R., 4, p. 733).

Mangels and sugar beets vs. silage, H. J. WATERS and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 37-52*).—This is a reprint of Bulletin 26 of the station (E. S. R., 6, p. 446).

Wheat feeding in Oklahoma, J. C. NEAL (*Oklahoma Sta. Bul. 13, pp. 73-76*).—Compiled information on the subject of feeding wheat to different kinds of farm animals.

On the comparative value of rape-seed cakes, V. STEIN (*Tidsskr. Landökon, 13 (1894), pp. 709-721*).

Colored rape-seed cakes, V. STEIN (*Landmandsblade, 27 (1894), pp. 765-767*).—The author calls attention to the artificial coloring of rape-seed cake, practiced to obtain the desired green color of the cakes and to disguise the admixture of inferior seed. The watery extract of the cakes gives strong reaction for lime, and is alkaline, while that of pure seed is acid.

The meat meal of commerce, A. ANDOUARD (*Ann. Agron., 21 (1895), No. 1, pp. 34-37*).—The food value of this material is briefly discussed, and danger from poisonous products of fermentation, and possibly the disease germs which it may contain, warned against.

Influence of quantity of food upon economy of milk and butter production, H. J. WATERS, W. H. CALDWELL, and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 24-36*).—A somewhat less detailed account of this experiment was given in Bulletin 24 of the station (E. S. R., 5, p. 596).

Practical rations for lambs, W. M. HAYS (*Minnesota Rpt. 1893, pp. 193-200*).—A reprint of Bulletin 31 of the station (E. S. R., 5, p. 1083)..

History of nutrition, L. BOURDEAU (*Histoire de l'Alimentation. Paris: 1894, pp. 372*).

The cost of keeping dry cows (*Landmandsblade, 27 (1894), pp. 783-786*).

Sheep raising, H. NATHORST (*Stockholm: 1894, pp. 173*).

VETERINARY SCIENCE.

Tuberculosis, E. P. NILES (*Virginia Sta. Bul. 39, pp. 43–54*).—This is a general discussion of tuberculosis. The results of a tuberculin test of the station herd and of one other herd are briefly stated, and attention is called to the fact that 1 animal which on *post-mortem* examination showed tuberculous lesions afforded when injected with tuberculin a reaction of only 1.1 degree.

DAIRYING.

Waste of fat in skim milk by the deep-setting process, W. H. JORDAN and J. M. BARTLETT (*Maine Sta. Rpt. 1893, pp. 95–100*).—This is a reprint of Bulletin 5 of the station (E. S. R., 5, p. 999), with a discussion of the necessity of submerging cans as compared with sinking them in the water to the depth of the milk in the can. The data presented in Bulletin 5 are considered with reference to this point. As a rule the skim milk from cans entirely submerged contains slightly less fat than that from cans not submerged or sealed.

"The value of submerging as a means of decreasing the waste of fat in the skimmed milk does not become apparent through the foregoing figures. It should be remembered, however, that in all these cases ice was used and kept in the tanks all the time. If this were not done the chances would appear to be in favor of submerging, because the greater the volume of water the less its temperature would be raised by cooling the warm milk."

Experiments in salting butter, W. S. SWEETSER and R. J. WELD (*Pennsylvania Sta. Rpt. 1893, pp. 58–60*).—In 3 separate trials the churning was separated into 3 equal portions, 1 portion being salted at the rate of 1 oz. per pound, another at the rate of 1½ oz. per pound, and the third not salted. In one case only ½ oz. of salt was used instead of 1½ oz. In 2 of the churnings a fourth portion was salted in the churn by the use of a strong brine. The separate lots of butter were all worked as nearly alike as possible, and samples were taken for the determination of water, fat, and salt. The results of the trials, including the analyses of the butter, are tabulated. The butter salted with ½ oz. of salt contained 11.7 per cent of water; that salted with 1 oz. averaged 9.84 per cent; with 1½ oz., 9.68 per cent; salted with brine, 12.09 per cent; and unsalted, 13.31 per cent. "The amount of salt retained in the butter varied in these trials from 1.35 to 6.02 per cent and seems to be dependent upon the amount of salt added." When the butter was salted with brine "practically none of the salt was retained. . . . Salting by this method seems to be labor and salt thrown away."

The composition of dairy products, H. SNYDER (*Minnesota Sta. Rpt. 1893, pp. 50–62*).—A reprint from Bulletin 27 of the station (E. S. R., 4, p. 150).

Butter substitutes, W. FREAR, J. W. FIELDS, and W. S. SWEETSER (*Pennsylvania Sta. Rpt. 1893, pp. 55–58*).—Analyses are given of 5 samples of butter, 4 of which were found to be spurious. Remarks are also given on the interpretation of results of butter analysis, with compilations showing the average composition of butter.

An apparatus for airing and cooling fresh milk, B. BÖGGILD (*Mälkeritid., 7 (1894), pp. 717–721*).

Bacteria in their relation to the dairy, O. LUGGER (*Minnesota Sta. Rpt. 1893, pp. 259–290*).—A popular and quite comprehensive paper on bacteria and other micro-örganisms, their effect on milk and dairy products, sterilizing and pasteurizing milk, use of pure cultures in butter making, etc. The information appears to be wholly compiled.

The Colibri butyrometer (*Tidskr. Landtmän, 15 (1894), pp. 905–907; Nord. Mejeri Tidn., 9 (1894), p. 573*).—The apparatus, which is essentially a modified Babcock milk test, is manufactured at Stockholm; it is a hand machine, arranged for 20 bottles.

Warning against the use of preservatives for butter (*Tidskr. Landtmän, 15 (1894), pp. 915–918*).

TECHNOLOGY.

Grass-tree gum, J. H. MAIDEN (*Agl. Gaz. N. S. Wales, 5 (1894), No. 11, pp. 748–758*).—Notes on this resin, the species of *Xanthorrhœa* exuding it, its collection, and uses. *X. hastilis* exudes the resin most abundantly, but it is also secreted by *X. arboræ*, *X. australis*, *X. preissii*, and *X. tateana.* The gum varies in color from yellow to dark red, and also in consistency. It was used by the natives for fastening on the heads of spears, and is now used as a substitute for shellac and in candle making. It has also been employed medicinally in cases of dysentery. Experimental notes, analyses, and a bibliography of the subject are included.

On the quantity of wood gum (xylan) contained in different kinds of wood, J. OKUMURA (*College Agr. Bul., Tokyo, Japan, vol. 2, No. 2, pp. 76–78*).—Determination of the quantity of wood gum in 21 kinds of wood. "The Coniferæ are comparatively poor in wood gum and Ternstrœmia and Melia are also poor. Cupuliferæ are richer, Juglans, Magnolia, Cladrastis, Acanthopanax, etc., are still more so."

Essential oil of hops, A. C. CHAPMAN (*Jour. Chem. Soc. London, 1895, Jan., pp. 54–63*).

On certain changes in fats as they become rancid, A. SCALA (*Ann. Inst. Igien. Sper. (Roma), 6 (1894), pp. 353–362; abs. in Staz. Sper. Agr. Ital., 27 (1894), No. 4, pp. 424, 425*).—The fats investigated were butter, hog's lard, and olive oil. These were exposed to light and air and allowed to become rancid. The iodin numbers decreased constantly as rancidity advanced. To oleic acid rancidity was chiefly due. By oxidation it breaks up into similar compounds, liberating glycerin, which in turn is oxidized and transformed. As rancidity increases the ether numbers ascend, indicating the formation of aldehydes and oxy acids.

On the fat content of palm nuts, H. NÖRDLINGER (*Ztschr. angew. Chem., 1895, No. 1, pp. 19, 20*).

AGRICULTURAL ENGINEERING.

The ten-block system of numbering country houses, A. L. BANCROFT (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 173–186, figs. 28*).—An illustrated paper giving in detail an ingenious scheme for blocking off and numbering country roads and houses according to a decimal system. Samples of its successful operation are given and the method is summarized as follows:

"The roads of an entire county are arranged in as long lengths as practicable and are all named. They are then measured, commencing at the county seat or at the end nearest to it, and each mile is divided into 10 equal parts or imaginary blocks, having frontage only. Two numbers are assigned to each block; one to each frontage, the odd ones upon the left and the even ones upon the right—10 blocks to a mile; 20 numbers to a mile. Any house having an entrance in a block has the number of that block. The number for all but the first house in a block is followed by a distinguishing letter—742, 742*a*, 742*b*, etc. Divide the even numbers by 2 and point off one decimal, and the distance in miles and tenths from the commencement of the road is shown."

Irrigation and cultivation (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 343–348*).—A general discussion of the irrigation of orchards in central and northern California with special reference to peaches and prunes.

Fertilization in relation to irrigation, S. M. WOODBRIDGE (*California State Bd. Hort. Rpt. 1893 and 1894, pp. 315–318*).—A general discussion of the use of fertilizers and irrigation, insisting on the necessary connection of the two, and urging investigations in regard to the various amounts of water required for different crops.

Trials of plows at Storehedinge (Denmark), 1893, F. BOKELMANN, J. C. LA COUR, and H. F. K. DENCKER (*Tidsskr. Landökon. 12 (1894), pp. 745–802*).

Cultivation by means of steam plows, L. DANGER (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 1, pp. 5–9*).

History of tests of agricultural machinery in Denmark (*Tidsskr. Landökon. 12 (1894), pp. 737–744*).

STATISTICS.

Reports of director and of treasurer of Maine Station (*Maine Sta. Rpt. 1893, pp. 4, 7–9*).—The treasurer's report for the fiscal year ending June 30, 1893, and a brief general report on the work of the station by the director.

Annual Report of Minnesota Station for 1893 (*Minnesota Sta. Rpt. 1893, pp. 350*).—A brief review of the work of the year, list of the bulletins published by the station since its organization, treasurer's report for the fiscal year ending June 30, 1893, a reprint of Bulletins 26–32, with an index to the same, and an account of some hitherto unpublished investigations mentioned elsewhere.

Annual Report of Pennsylvania Station for 1893 (*Pennsylvania Sta. Rpt. 1893, pp. 7–13*).—This contains the treasurer's report for the fiscal year ending June 30, 1893, a brief review of the work of year by the director, and accounts of investigations noticed elsewhere.

Report of the statistician (*U. S. Dept. Agr., Division of Statistics Rpt. 122, pp. 705–778*).—The principal subjects treated are the following: Meteorological conditions of the year; crop review; statistics of the acreage, yield, and value in 1894 of the principal crops; farm prices December 1, 1894, of corn, wheat, rye, oats, barley, buckwheat, potatoes, sweet potatoes, hay, cotton, and tobacco; wholesale prices of corn, wheat, oats, barley, hay, cotton, butter, eggs, and tobacco in the principal cities in 1893 and 1894; statistics of agricultural exports and imports for 1893 and 1894; statistics of foreign crops; notes on foreign agriculture; and transportation rates. From the Abstract of the Eleventh Census of the United States tabular statements are compiled relative to the number, size, and value of farms; percentage of owned and rented farms; value of farm products per acre; and total value of land, improvements, machinery, and live stock in the different States.

MISCELLANEOUS.

Treatise on agriculture, A. ALOI (*Trattato di Agraria, vol. II, Agricultural. G. B. Paravia & Co., 1895, pp. 478*).

Advanced agriculture, H. J. WEBB (*London: Longmanns, Green & Co., 1894, pp. VI and 672*).

The education of gardeners, G. S. BOULGER (*Gard. Chron., 17 (1895), ser. 3, pp. 165, 166*).—To be continued.

Agricultural depression at home and abroad, W. E. BEAR (*Jour. Roy. Agl. Soc. England, 3d ser., 5 (1894), No. 20, pp. 673–695*).

The sale of cattle and the meat supply of Germany during 1891–'94, J. ARUP (*Tidsskr. Landökon. 13 (1894), pp. 685–708*).

The meat supply of England, 1893, J. ARUP (*Fifth Rpt. Danish State Agl. Councilors, 1893. Copenhagen: 1894, I–XIV*).

The conditions of North American competition in meat supply of England, N. HEYMAN (*Tidsskr. Landökon. 12 (1894), pp. 803–856*).

Agriculture in British Honduras (*Kew Misc. Bul. 97, pp. 9–11*).

Fifth Report of the Danish State Agricultural Councilors, 1893 (*Copenhagen: 1894, pp. 168*).

Annual Report of the Royal Danish Agricultural Society, 1893–'94 (*Copenhagen: 1894, pp. 180*).

Annual Report of the Royal Society for Norway's Weal for 1893 (*Christiania: 1894, pp. 102*).

Press bulletin excerpts (*Oklahoma Sta. Bul. 11, pp. 47–68*).—This is a summary of the more important articles furnished by the different departments of the station to the 15 press bulletins issued by the station since March, 1893.

NOTES.

CORNELL UNIVERSITY AND STATION.—A large room has been provided by the horticultural department to be used as a class room and museum, which will contain a collection of spraying apparatus, including every known device for spraying.

A law has been passed by the legislature of the State of New York appropriating $16,000 to be expended for horticulture in the fifth judicial department of the State, an area lying north and west of Cayuga Lake and including 16 counties. This fund is to be expended "in conducting investigations and experiments in horticulture; in discovering and remedying the diseases of plants, vines, and fruit trees; in ascertaining the best means of fertilizing vineyard, fruit, and garden plantations, and of making orchards, vineyards, and gardens prolific; in disseminating horticultural knowledge by means of lectures or otherwise, and in preparing and printing for free distribution the results of such investigations and experiments, and such other information as may be deemed desirable and profitable in promoting the horticultural interests of the State." All this work is to be prosecuted by Cornell University "under the general supervision and direction of the commissioner of agriculture." Agents and instructors are already in the field.

OHIO STATION.—A substation is being established at Strongsville, Cuyahoga County, on the heavy clay soil which characterizes a large portion of northeastern Ohio. It is intended to duplicate on this soil the experiments with fertilizers which are being conducted at the station at Wooster and at the substations at Columbus and in Fulton County.

PENNSYLVANIA STATION.—The burning of the State printing office at Harrisburg, February 9, destroyed the manuscript of the Report of the State College and the Experiment Station for 1894. The loss involves a large amount of labor and expense, as the report was to be an unusually elaborate and highly illustrated one. Work has already begun on its reproduction, but its distribution will necessarily be somewhat delayed, as none of the cuts were saved.

WASHINGTON COLLEGE.—The first annual winter school for farmers aroused much interest and enthusiasm among the farmers. The attendance represented 10 counties, and 303 were enrolled. The winter school will be made a permanent feature of the college work.

ANALYSIS OF SOILS AND ASH.—In conformity with the expressed desire of the Association of Official Agricultural Chemists at its last convention, that the availability of potash and phosphoric acid in soils should be made a subject of investigation during the present year, the "Directions for work on soil and ash samples" of the reporters on soils and ash recently issued provide, among other things, for the determination of the potash and phosphoric acid dissolved by digestion of the soil in 1 per cent citric acid for five hours with frequent thorough shaking; digestion for the same length of time in a solution of 6.3 gm. of oxalic acid in 1 liter of water; and digestion in the same manner in a solution containing 20 gm. of crystallized oxalate of ammonia and 2.15 gm. of anhydrous acetic acid. "The soils selected for study are from experimental fields that have been in cultivation as such for a series of years and the character of the soil is well known. One contains an abundance of available phosphoric acid, but not enough available potash, as shown by its responding to potash fertilizers in the field and not to phosphates. The other responds promptly to phosphates, and hence is probably deficient in available phosphoric acid. The plan is to demonstrate this difference by the action of solvents, and by selecting the solvent and method of treatment that is found to yield results in closest relation to the field results we will have the basis of a method for determining chemically the soil's needs."

PERSONAL MENTION.—Prof. R. Warington, the newly elected professor of rural economy of Oxford University, delivered his inaugural lecture February 4, the subject being the "Present relations of agricultural art and natural science."

Dr. A. Koch has been chosen professor of physiological botany in Göttingen.

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EXPERIMENT STATION RECORD.

VOL. VI. No. 9.

At the last convention of the Association of Official Agricultural Chemists the abstract committee was requested to arrange for the periodical publication of their abstracts in the Experiment Station Record, the object being to make the abstracts more promptly available to the members of the association. This committee consists of five persons, and was first provided for at a meeting of the association in 1892. Its function is to prepare abstracts of current work on methods of analysis. Previous to that time a review of the work of the year had usually been furnished by the reporters on methods, each confining himself to his own special subject. It was expected that the abstract committee would not only relieve the reporters of this work but would also cover the ground more completely. The committee for 1894–'95 consists of W. Frear, of the Pennsylvania State College, chairman; W. D. Bigelow, of the Division of Chemistry of this Department; J. P. Street, of the New Jersey State Station; W. E. Stone, of Purdue University, Indiana; and R. H. Loughridge, of the University of California. This committee has arranged for the publication of its abstracts in the Record, and several abstracts have already appeared. The names of the members of the committee are attached to the abstracts prepared by them. It is hoped that by the coöperation of the association and the Division of Chemistry with this Office a quite complete survey of the work in agricultural chemistry now in progress throughout the world may be promptly presented to the readers of the Record.

In the present number of the Record Dr. Ewald Wollny begins a short series of articles in continuation of those published in volume 4, in which he will present a summarized statement of the results of investigations on the physical properties of soils. Renewed interest is being taken in soil investigations at home and abroad, especial prominence being given to studies of the physical properties and the bacteriology of soils. This is shown by the recent establishment of the Division of Agricultural Soils in this Department, which will give a very prominent place to studies of the physical properties of soils; by the investigation of the chemical composition and bacteriology of soils undertaken by the Division of Chemistry; and by the recent official announcement that the United States Geological Survey will broaden the scope of its work to include the nature and history of soil formations and the mapping of soil areas. As this subject is very complex, it is desirable that the various lines of investigation may before long be established on a thorough and permanent basis in different parts of the country through the coöperation of this Department, the experiment stations, and the agricultural colleges. There are three principal lines of investigation: The chemistry of the soil, in which a vast amount of data has been accumulated, for which there is at present no satisfactory interpretation, but in which there is yet important work to be done upon methods of chemical analysis and upon the form of combination in the soil; the bacteriology of the soil, which has hardly yet been placed upon a systematic basis; and the physical properties of soils. This last should include the texture and structure of soils and their relation to water and heat. The origin and the formation of the soils and their geological classification and areal mapping should be considered, as well as the effect of soil conditions, especially the amount of moisture existing in different types of soil or maintained by different methods of cultivation, upon the physiology of the plant. Meteorology should likewise be studied in all its bearings upon soil areas and different soil formations. A serious hindrance to the organization of a wide and thorough system of soil investigation in this country is the lack of instruction in this important subject in our colleges, and of properly trained experts to carry out the details of the work. Opportunities are open now for a considerable number of workers in these lines. In view of these facts more attention should be paid to those branches which have a direct bearing upon original research in soils, and several centers of instruction should be established in certain sections of the country, presided over by men who are authorities on soil studies and who are themselves carrying on important soil investigations. It is important, in the first place, that a well-considered and systematic course of instruction bearing upon soil investigations should be presented at these institutions. The special line of research should depend partly upon the environment and condition of the institution. Different portions of our country offer exceptional advantages for work in one or more of these lines. The physical and physiological problems can best be studied in the arid regions where irrigation is practiced and the water supply can be controlled. In the Middle and Southern Atlantic and Gulf States suitable material for inquiries on the geologic problems is found in the wide number of distinctly typical soil conditions there represented. In the glaciated area none of these problems can be so well investigated, but chemical and bacteriological studies of soils can be as well carried on there as elsewhere. Specialization will count for as much here as elsewhere, and it will be far better that only a few well-equipped institutions should undertake this work and stake their reputation largely upon it. Great soil areas and great agricultural conditions must be considered, rather than interests bounded by State lines.

THE PHYSICAL PROPERTIES OF THE SOIL.

Dr. EWALD WOLLNY.

PART 1.

Having already shown[1] the significance of the physical properties of the soil in the growth of plants, I shall attempt in the following pages to set forth briefly, in the light of investigations made up to the present time, the nature of these properties and the corresponding differences among soils of different kinds under varying external conditions.

I.—THE PRINCIPAL SOIL CONSTITUENTS.

We may regard quartz, lime, clay, and humus as the principal constituents of the soil which influence its texture or mechanical character, and hence its behavior toward water, air, and heat, although under certain conditions a similar influence may be exercised by iron compounds and certain salts. In so far as the character of the mass depends on the size of its component particles, the constituents may be divided into sand (fine and coarse), finer particles which can be easily washed away (silt) and humus. The fact that these substances have very different properties, and occur in widely varying proportions, explains the marked differences that exist in the physical properties of natural soils, and a knowledge of the principal peculiarities of these individual constituents, and of their mutual relations, as well as of the proportions in which they are present in any particular instance, is therefore of primary interest and importance.

II.—GENERAL PHYSICAL PROPERTIES OF THE SOIL CONSTITUENTS AND OF THE SOIL AS A WHOLE.

THE SIZE OF THE SOIL PARTICLES.

The size of the soil particles varies within wide limits. In plastic clays the size of the grains is between 0.0001 and 0.005 mm.;[2] in the coarsest kinds of sand they are as high as 2 mm. in diameter. The extreme variation is therefore between 0.0001 and 2.0 mm. That part of the soil consisting of particles 2 to 5 mm. in diameter is called gravel, 5 to 10 mm. coarse gravel, and above 10 mm. stones. The portion made up of particles over 0.25 mm. in diameter is termed the "soil skeleton," that of finer grains the "fine earth." According to the preponderant size of the grains we distinguish between gravelly, sandy, coarse-grained, fine-grained, and dusty soils.

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[1] E. S. R., 4, pp. 528, 627.

[2] M. Whitney, U. S. Dept. Agr., Weather Bureau Bul. 4.

THE FORM OF THE SOIL PARTICLES.

This is generally very variable. The finest particles of clay are long and rounded, and rather uniform in shape; in sands the grains are frequently more or less cubical. Most of the other soil elements are of angular and irregular form.

Molecular constitution of the soil particles.—All particles of mineral origin are either crystalline or amorphous. In the former, and to a certain extent in the latter case, they are nearly or quite impermeable to water and gases. Some of the amorphous constituents have the properties common to colloid substances of swelling up in presence of water and forming a sort of jelly, and of returning to their original condition on drying. Examples of such colloid substances are the plastic constituents of clay, the amorphous zeolitic silicates, ferric oxid, silicic acid in certain conditions, and humus. These materials, although to a considerable extent hypothetical, are of great significance in the study of the physical and chemical properties of the soil. Upon them depends the plasticity of clay soils. Decaying plant remains render soils more porous and hence more permeable to gases and liquids.

Determination of the size of the particles (mechanical analysis), and of the soil constituents.—Mechanical analysis of soils, by means of sieves, or by elutriation, consists in the separation of the soil into portions of varying coarseness, and the quantitative determination of the proportions of these different grades. In this way the soil may be separated into the following products:

Grades obtained in mechanical analysis of soils.

Soil skeleton..	(1) Over 10 mm. diameter	stones.
	(2) 10 to 5 mm. diameter	coarse gravel.
	(3) 5 to 2 mm. diameter	medium gravel.
	(4) 2 to 1 mm. diameter	fine gravel.
	(5) 1 to 0.5 mm. diameter	coarse sand.
	(6) 0.5 to 0.25 mm. diameter	medium sand.
Fine earth....	(7) 0.25 to 0.1 mm. diameter	fine sand.
	(8) 0.1 to 0.05 mm. diameter	coarse silt.
	(9) 0.05 to 0.025 mm. diameter	medium fine silt.
	(10) 0.025 to 0.005 mm. diameter	fine silt.
	(11) 0.005 to 0.0001 mm. diameter	colloid clay.

Grades 1 to 5 are separated by sieves with circular holes, grades 7 to 11 by elutriation.

In preparing a sample of soil for analysis care must be taken that the coarser materials are freed from finer particles, and that all lumps are broken up. This is effected by boiling for 10 to 20 hours with distilled water.[1] The sample so treated is washed through a sieve with round holes by means of distilled water, using a brush if necessary.

Elutriation may be carried out in two ways. One of these depends on the subsidence of solid bodies in water and may be called the decantation or hydrostatic method (Davy, Schübler, Sprengel, Benningsen-Förder, Knop, Schlösing, Kühn, Osborne, Fadejeff). The other depends on the force of upward flowing water, or hydraulic pressure, and is called the hydrodynamic method (Nöbel, Schöne, A. Mayer, Hilgard). Of the modifications of the first or hydrostatic method, Kühn's is preferable for ordinary work on account of its simplicity; Fadejeff's method, however, gives more exact and more closely agreeing results. Of the hydrodynamic methods, those using a conical washing vessel (Nöbel, Schöne, A. Mayer) give unsatisfactory results, on account of the backward currents along the sides of the vessel, which produce flocculent aggregates of the smaller grains which sink to the bottom and remain with the coarser sand. To avoid this difficulty Hilgard uses a vertical cylindrical tube and an agitating apparatus the object of which is to destroy any floccules that may be formed. Hilgard's apparatus may be regarded as the most satisfactory, at least for particles less than 0.1 mm. (8 mm. hydraulic value), which has yet been devised.[1]

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[1] E. W. Hilgard, Forsch. Geb. agr. Phys., 2, p. 57.

In carrying out mechanical soil analysis of any kind various precautions must be observed in order to insure accuracy. Besides the 10 to 20 hours' brisk boiling of the sample which is essential, water as pure as possible (distilled) must be used in the elutriation, because in water containing salts floccules are apt to form which settle and remain with the coarser ingredients. For the same reason the apparatus must be protected from all variations of temperature and from strong light. It is therefore best placed in a dark cellar which is subject to only slight variations in temperature. For the accurate separation of sediments of definite hydraulic value the elutriation must be preceded by the removal of the clay, as otherwise the heavy, clayey water, having a high hydraulic value, will carry away larger particles than correspond to the real velocity of the water. The other particles may be separated from the clay by repeated sedimentation in a column of water 20 cm. deep for periods of 24 hours.[2]

The separation of soil into the above-mentioned portions furnishes a basis for interpretation of those physical properties which depend upon the size of the soil particles, but throws no light on the influence in this respect of colloid and humus substances. Colloid clay[3] is the most important of the former class, for to it is due the property of plasticity. Kaolin particles occur in the soil, but they behave like any other mechanical constituent, and are no more plastic than chalk or fine siliceous earth. For the determination of "active" clay the method of Hilgard just mentioned, or that of T. Schlösing, may be used.[1] The clay sediment, however, may contain fine particles of other substances besides clay, such as quartz, ferric hydrate, etc., and it may be necessary to determine these chemically and subtract the weight of these from the total weight of the sediment.

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[1] F. Wahnschaffe, Anleitung zur wissenschaftlichen Bodenuntersuchung, 1887, p. 23. T. B. Osborne, Forsch. Geb. agr. Phys., 10, p. 196. E. W. Hilgard, Ibid., 2, p. 57, and 6, p. 52. A. Mayer, Ibid., 5, p. 228.

[2] E. W. Hilgard, Forsch. Geb. agr. Phys., 6, p. 53.

[3] M. Whitney and others have recently ascribed the properties of colloid clay and other similarly constituted substances to the extreme fineness of their particles, and hence the very much greater attraction the latter can exert compared with any substances made up of comparatively coarse grains.

The humus substances are also determined chemically, especially the colloid humus matter (*matière noire*) which is physically very important. This determination is best made by Grandeau's method.[2]

When the constituents themselves are considered in their relation to the properties of the soil, aside from the effect due simply to the size of the particles, as for instance with reference to the conduction of heat, chemical analysis can not be dispensed with, for mechanical examination can not give the necessary information.[3] Under certain circumstances it may be of importance to make an examination of the mineral constituents of the different sediments.[4]

THE ARRANGEMENT OF THE SOIL PARTICLES (STRUCTURE OF THE SOIL).

Separate grain structure.—If we consider a soil divided up into its individual particles, which are massed together more or less closely, we see that the size of the interstitial spaces and consequently the movement of water and air in the soil are dependent solely on the size and form of the particles. This arrangement is called (after Hilgard) the "separate grain structure" (*Einzelkornstructur*). If the particles are spherical and of equal size they can be supposed to be massed together in either of two ways: (1) Each sphere rests in the space between the adjoining spheres (Fig. 4), or (2) the planes tangents to the spheres at all their points of contact intersect at right angles. The former arrangement produces a three sided or four sided regular pyramid while the latter gives rise to a cubical form (Fig. 5). In the first case the arrangement is the most compact possible and the volume of the intergranular space (volume of pores) amounts to 25.95 per cent of the total volume. In the second case we have the least compact arrangement, and the volume of the pores rises to 47.64 per cent of the total

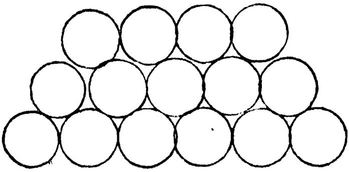
FIG. 4.

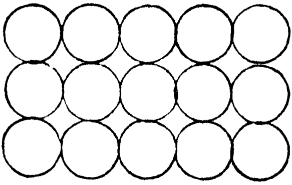
FIG. 5.

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[1] E. Ramann, Forstliche Bodenkunde, Berlin, 1893, p. 50.

[2] Jour. Agr. Prat., 36 (1872), No. 14-17. Compt. Rend., 74, p. 988.

[3] F. Wahnschaffe, l. c., p. 43-85.

[4] F. Steinriede, Anleitung zur mineralogischen Bodenanalyse, 1889.

volume.[1] The volume actually occupied by the solid particles is independent of the size of the spheres, in both the above cases, so long as all the spheres in the mass are the same size.[2]

In ordinary arable soils the conditions are somewhat different, due to the fact that the particles are not spherical and are of different sizes, and that external conditions exercise a considerable influence on the structure. The arrangement may be more compact than in the first case described above on account of the smaller grains depositing themselves in the spaces between the larger ones (Fig. 6), or may be less compact than in the second when the particles arrange themselves as in Fig. 7. Shaking and packing increase the density of the soil, but this is principally caused, and to the greatest extent, by the percolation of water, which acts mechanically on the soil (puddling it).

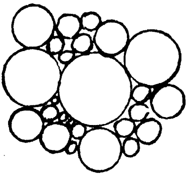

FIG. 6.

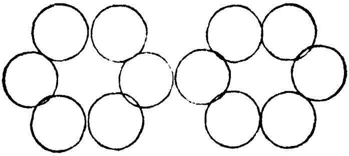

FIG. 7.

The volume actually occupied by soil particles is smallest, relatively, in soils containing porous fragments, especially those rich in humus (peat).

From what has been said it is not surprising that the volume of the pores, which depends on the arrangement of the particles, varies within wide limits in natural soils. According to the experiments made on this subject by C. Flügge[3] the volume varies in mineral soils between 20 and 57.8 per cent, while in peat and moor soils it may rise to 85.2 per cent, according to E. Ramann and A. R. von Schwarz.[4]

Crumbly structure.—In many soils aggregates or floccules are formed under certain circumstances. This kind of arrangement differs from that already described principally in the occurrence of a considerable number of larger spaces between the aggregates, owing to the virtually larger size of the particles. These larger spaces bring about very important differences in the physical properties of the soil, especially in its behavior toward water and air. This kind of arrangement of the soil particles is shown in Fig. 8.

There are various reasons for the formation of aggregates. The tendency is approximately inversely proportional to the size of the particles concerned, and ceases for the most part in quartz powder when the diameter of the grains rises to 0.2 mm., supposing all the particles to be of the same size, for particles larger than 0.2 mm. diameter may enter into aggregates made up for the most part of smaller grains. The number of grains which can cohere in this way varies also in approximately the same manner. The larger the individual grains the more easily their aggregates fall to pieces. The occurrence of sediments of the same hydraulic value but of different specific gravity show that a higher density tends to diminish flocculation. This tendency also decreases rapidly with an increase in temperature, being very weak in water near its boiling point.[1] Colloid substances are also very influential in the formation of floccules, and the free insoluble humus acids produce the same result by binding the other constituents together.[2] The formation of aggregates is greatest when the soil contains a medium quantity of water, *i. e.*, about 40 per cent of the maximum quantity which it is capable of holding, and a greater or less quantity of water always diminishes the tendency toward flocculation.[3]

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[1] F. Soyka, Forsch. Geb. agr. Phys., 8, p. 1.

[2] C. Lang, Ibid., 1, p. 109.

[3] Beiträge zur Hygiene, Leipsic, 1879. E. Wolff, Anleitung zur chemischen Untersuchung landwirthschaftlich wichtiger Stoffe, 1875. F. Renk, Ztschr. Biol., 15. E. Ramann, l. c. Veitmeyer, Vorarbeiten zur Wasserversorgung der Stadt Berlin, 1871 and later.

[4] Forsch. Geb. agr. Phys., 2, p. 164.

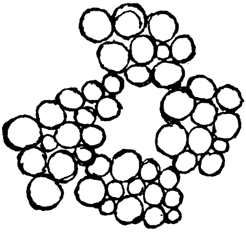

FIG 8.

Of secondary importance is the fact that the soluble salts of the soil, even when present in very small quantities, exert an important influence on its structure.[4] Caustic alkalies (potash, soda, and ammonia), as well as their carbonates and phosphates, cause a compact arrangement of the individual grains, and hinder or prevent the formation of aggregates, while the mineral acids (hydrochloric, sulphuirc, and nitric) and their salts, with the exception of the neutral alkaline sulphates, which rather approach the preceding group in behavior, materially aid flocculation. In the case of the chlorids and nitrates this is true only while they remain in the soil liquids. When they are washed out by the atmospheric water, which readily takes place, a more compact arrangement of the individual atoms results. Calcium hydrate (caustic lime) and, to a less extent, calcium carbonate help to form light, loose aggregates, which resist external influences tending toward their disintegration for a longer or shorter time, according to the quantity of the flocculating substance present.

Among external factors which influence the structure of the soil frost is of first importance. By the freezing and consequent expansion of the water the particles are torn apart. In a compact soil having a tendency to form floccules frost will, as a rule, bring about a crumbly structure, while in a soil already mechanically finely divided the particles will be either so far separated as to cause the formation of the "separate grain" structure, or may be more closely consolidated by the action of frost.

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[1] E. W. Hilgard, Forsch. Geb. agr. Phys., 2, p. 441.

[2] T. Schlösing, Compt. Rend., 64, p. 1408.

[3] H. Puchner, Forsch. Geb. agr. Phys., 12, p. 239.

[4] E. W. Hilgard, Forsch. Geb. agr. Phys., 2, p. 441. A. Mayer, Ibid., p. 251.

Destruction of the crumbly structure is promoted by violent shaking with water, kneading, and boiling of the mass. These means, as is well known, are used in pottery work to increase the plasticity of the clay, the object being to break up aggregates of particles as completely as possible.

Atmospheric water exerts a decided influence on the structure of the soil by altering the position of the soil particles and also by carrying the smaller grains downward. The crumbly structure of the soil is destroyed more or less by the percolating water, which loosens particles from the fragments and washes them into the larger spaces, and this takes places in proportion to the quantity of the percolating water and the lack of tendency toward flocculation in the soil. The greater the force of the falling water the sooner the soil assumes the separate grain structure, and therefore violent thunderstorms may entirely change the mechanical condition of the soil in a short time. From such facts we may infer that the frequency of atmospheric precipitation, other things being equal, exercises a great influence on the structure of the soil. Frequent light rainfalls have much less effect than violent storms at longer intervals.

Covering the soil with living or dead plants lessens the mechanical effect of atmospheric precipitation by breaking the force of the falling water and retarding its penetration into the soil, and this influence of plant cover varies with its compactness and state of development. If the ground is covered with straw, the compacting of the soil by rain will diminish as the thickness of the covering increases.[1]

Structural changes in the soil may also be caused by the washing away of the surface particles on sloping land by the water that does not sink into the soil (erosion). In the case of leaching, the washing of the smaller particles into the subsoil increases with the differences in the size of the particles; in the case of erosion the washing away of the finer-grained constituents is greater the less compact the soil, the greater the slope, and the heavier the rainfall. In both cases change in position of the soil particles is prevented to a great extent by a covering of living plants whose roots hold the soil together. Forest growth has a stronger retarding action than that of perennial herbs.

The wind transports the finer particles of dusty soils in proportion to its strength. The places from which the material has been blown necessarily have a coarser soil structure than those composed of the deposited dust.[2]

Finally, the animal life of the soil exerts an important influence on the formation of aggregates. This is especially true of the ordinary earthworm, whose digging, burrowing, and excretions are important agencies in the formation of vegetable mold.[1]

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[1] E. Wollny, Forsch. Geb. agr. Phys., 12, p. 31.

[2] T. F. Hensele, Ibid., 16, p. 311.

CHANGES IN VOLUME OF THE SOIL.

Variations in the volume of soils are shown by changes in the space occupied when different quantities of moisture are present. These changes are most marked in soils which contain much colloid material (clay, and especially humus matter), while in sands they are not observed, or only to a slight extent in very fine sands. In the latter case the expansion is due solely to the surrounding of particles by water when the soil is very wet.[2]

In clays and clayey soils the changes in volume consequent on drying cause a vertical and especially a horizontal tension in the mass. Loss of water at the surface of the soil causes a contraction of the uppermost layer and a consequent strain from below upward, reaching to a depth dependent upon the depth of the surface drying. Under such circumstances the soil must become more closely compacted and the surface sink to a lower level. These changes in volume often cause cracking of the soil, chiefly due to the horizontal tension already mentioned. This separation of the soil particles will decrease as the force increases which holds the particles together, that is, as the cohesion of the soil increases (see below). Experience teaches, however, that even the most tenacious soils have not sufficient resistance to prevent the formation of cracks by lateral tension when drying proceeds to a considerable extent. It is plain that this tension is not uniform either at the surface or below because the drying and the consequent contraction goes on more quickly in some parts of the soil than in others. The top layers dry soonest and most completely and therefore contract more strongly than the lower and moister strata. The cracks formed, then, will be widest at the top and will become narrower on descending.[3]

The cracks formed in the same soil by drying are deeper, narrower, and less numerous the more compactly the particles are arranged, and *vice versa*.[4]

Expansion and contraction of the soil are also observed in freezing and thawing, and the greater the quantity of water in the soil the more marked are the changes in volume due to this cause, being especially marked in soils rich in humus and clay.

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[1] C. Darwin, The Formation of Vegetable Mold Through the Action of Earthworms, 1882. V. Hensen, Landw. Jahrb., 1882, p. 661. P. A. Müller, Die natürlichen Humusformen, 1887. E. Ramann, Forsch. Geb. agr. Phys., 11, p. 299. E. Wollny, Ibid., 13, p. 382. E. Ebermayer, Allgemeine Forst- und Jagdztg., 1891, p. 71.

[2] G. Schübler, Grundsätze der Agriculturchemie, 1838, pt. II, p. 82. E. Wolff, l. c., p. 71. F. Haberlandt, Fühling's landw. Ztg., 1877, p. 481. A. R. von Schwarz, Forsch. Geb. agr. Phys., 2, p. 166.

[3] F. Haberlandt, Wissenschaftlich-practische Untersuchungen auf dem Gebiete des Pflanzenbaues, 1875, vol. 1, p. 22; Forsch. Geb. agr. Phys., 1, p. 148.

[4] E. Wollny, Forsch. Geb. agr. Phys., 5, p. 43.

THE COHESION OF THE SOIL.

Cohesion is the force with which soil particles adhere to one another. As a measure of this we may use the resistance which the soil opposes to a separation by tension (relative firmness) or pressure (absolute firmness), or to the penetration of a wedge-shaped body (resistance to separation). Cohesion depends on the mechanical constitution and the humidity of the soil as well as on the presence of different salts. Of the soil constituents clay possesses the greatest cohesive power, while the particles of quartz, humus, and lime are comparatively weak in this respect. The cohesion of a soil, therefore, increases with the quantity of clay it contains and diminishes as the quantity of quartz, humus, or lime increases. Under otherwise similar conditions the attraction between the soil particles is greatest when the particles are smallest. It also depends on their arrangement. Soils with separate grain structure, other conditions being the same, have a higher cohesion than crumbly soils. By pressure the cohesion is increased in proportion to the force acting. The influence of water is apparent in the fact that in clays and soils rich in clay the cohesion is greatest when the quantity of water present is least, while in humus, quartz, and chalk the constituents of the soil cohere most strongly when a definite proportion of water is present, either more or less than this quantity causing a decrease in cohesion. The freezing of water in the soil causes a remarkable increase in the resistance offered to the penetration of a wedge-shaped body (resistance to separation), and also to forces tending to break up the mass (absolute firmness). By mixing caustic lime with clay the firmness of the latter is considerably diminished for all states of moisture, while potassium hydrate or alkaline carbonates increase the cohesion in the dry state and seem to decrease it when the mass is very moist. Other conditions being equal, the resistance to the entrance of wedge-shaped bodies is much greater when the soil is covered with plants than when bare.[1]

THE ADHESION OF THE SOIL.

This property is apparent in the fact that the soil adheres to a greater or less extent to the wood and iron parts of agricultural implements. From the investigations on this subject, it appears that a number of circumstances seem to influence the force which causes adhesion.[2] It is proportional to the surface in contact and increases with the amount and duration of pressure.

In sandy soils (quartz and calcareous sand) adhesion is greater the smaller the particles; in powdery soils (separate grain structure) adhesion is considerably higher than in the same soil in a crumbly condition. Of the different soil constituents, clay shows the strongest adhesion to wood and iron and humus the weakest, while quartz is intermediate. The soil, therefore, adheres to the implements most strongly when it is rich in clay and less strongly when quartz and humus predominate. The influence of water varies in differently constituted soils. In sandy soils adhesion increases with an increase of water up to complete saturation. In soils rich in clay adhesion to wood and iron reaches a maximum at a definite humidity (80 per cent of the quantity required for saturation), below and above which adhesion decreases. Humus seems to act like quartz, in respect to the influence of moisture. In the dry state, adhesion in all kinds of soils is zero.

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[1] W. Schumacher, l. c., p. 125. G. Schübler, l. c., p. 74. F. Haberlandt, Wissenschaftlich-practische Untersuchungen auf dem Gebiete des Pflanzenbaues, 1875, vol. 1, p. 22; Forsch. Geb. agr. Phys., 1, p. 148. H. Puchner, Ibid., 12, p. 195.

[2] G. Schübler, l. c., p. 76. F. Haberlandt, Der allgemeine landwirthschaftliche Pflanzenbau, 1879, p. 393. F. Schachbasian, Forsch. Geb. agr. Phys., 13, p. 193.

The addition of caustic lime has no appreciable effect on the adhesion of soil to agricultural implements, but caustic alkalies seem to cause a firmer adhesion of clay.

Clayey soils adhere to wood more firmly than to iron, while with soils rich in quartz and humus the reverse is true. Adhesion of soils to rusty iron is almost invariably less than to polished iron, and in case of soils rich in clay, less than to wood. Only in soils containing much quartz are the adhesive values greater for rusty iron than for wood.

THE FRICTION OF SOILS ON WOOD AND IRON.

The resistance which is offered by friction to the sliding of implements over the soil is expressed by the ratio of the force which is necessary to overcome the resistance to friction to the weight of the moving or sliding body (coefficient of friction). This coefficient varies, according to the nature of the materials concerned, between 0.33 and 0.82. Other properties being the same, fine-grained soils show a greater resistance when moist than when dry. If the soil is moist, the resistance offered to wooden and iron implements is greater when the soil has the separate grain structure than when it is crumbly, but if the earth is dry the reverse is true. As regards the behavior of the various soil constituents, experiments[1] show that the coefficient of friction is greatest in quartz sand or calcareous sand, and smallest in clay, while humus possesses an intermediate value. The coefficient of friction diminishes with the quantity of moisture in the soil, and is greater for wood than for iron. Rust increases considerably the coefficient of friction for iron.

THE SPECIFIC GRAVITY OF THE SOIL.

This is the ratio of the weight of the soil to that of an equal volume of water considered as unity. For different soil constituents the following values have been found (E. Wollny):

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[1] F. Schachbasian, Forsch. Geb. agr. Phys., 13, p. 214.

Specific gravity of soil constituents.

Quartz	2.622
Clay	2.503
Lime, carbonate crystalline	2.756
Lime, carbonate precipitated	2.678
Gypsum, precipitated	2.318
Oxid of iron	4.54–5.20
Hydrated oxid of iron	3.760
Humus	1.462

With these values it is possible to calculate the density of any soil.

The more important minerals occurring in soil have the following specific gravities:[1]

Specific gravity of different minerals.

Feldspar	2.5 to 2.8	Calcite	2.6 to 2.8
Orthoclase	2.5 to 2.6	Dolomite	2.8 to 3.0
Oligoclase	2.6 to 2.7	Chlorite	2.7 to 3.0
Labradorite	2.6 to 2.8	Talc	2.6 to 2.7
Augite	3.2 to 3.5	Magnetite	4.9 to 5.2
Hornblende	2.9 to 3.4	Limonite	3.4 to 4.0
Mica	2.8 to 3.2	Hematite	5.1 to 5.2
Potash mica	2.8 to 3.0		
Magnesia mica	2.8 to 3.2		

THE VOLUME WEIGHT OF THE SOIL.

This is also called apparent specific gravity, and is the weight of a given volume of the soil compared with an equal volume of water. In the specific gravity we are concerned only with the volume of the actual solid matter of the soil, exclusive of the air or water that occurs in the spaces between the particles; in the volume weight we consider the soil as a whole, including the spaces occurring in it.

According to the investigations of the author[2] quartz has the highest volume weight in the air-dry state (1.4485), humus the lowest (0.3349), and clay a value intermediate between the two (1.0108). The volume weight of soils, other things being equal, increases with the presence of iron and stones. The volume weight of one and the same soil depends on the mode of arrangement of the particles and is subject to great variations. The more compactly the particles are arranged the greater is the weight of the mass, when equal volumes are considered, and *vice versa*. Under otherwise similar circumstances the coarser the grains the higher the volume weight. A mixture of grains of different sizes has a higher volume weight than a mass composed of grains of the same size, large or small. By the formation of floccules in a soil, its volume weight is decreased in proportion to the coarseness of the aggregates formed.

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[1] G. Schübler, Grundsätze der Agriculturchemie, 1838, pt. II, p. 61. C. Trommer, Die Bodenkunde, 1857, p. 258. A. von Liebenberg, Ueber das Verhalten des Wassers im Boden, Inaugural-Dissertation, Halle, 1873. C. Lang, Forsch. Geb. agr. Phys., 1, p. 136. G. Ammon, Ibid., 2, p. 26. E. Wollny, Ibid., 8, p. 347. E. Ramann, Forstliche Bodenkunde, 1893, p. 61.

[2] Forsch. Geb. agr. Phys., 8, p. 349.

With regard to the influence of water, experiments have shown that the volume weight of soils increases with the water content, and the increase is proportional to the water capacity of the soil. The differences in volume weight correspond, in general, when soils are approximately equally saturated, to those in air-dry soils, though the values are more concordant in moist soils.

The expressions "heavy" and "light" soils, used in practice, have no reference to the weight of the mass, but to the resistance which the soil opposes to cultivation.

It is sometimes advisable to examine the soil in its natural state on account of the not inconsiderable variations in the volume weight. This is most conveniently done by lifting out a column of the soil by means of a sampling tube which is driven to a definite depth in the earth and drying and weighing the sample.[1]

THE COLOR OF THE SOIL.

This is due to the presence of certain constituents. The principal mineral ingredients of the soil (clay, lime, and quartz) are white when pure. When the soil is of some other color it is caused by the presence of humus matter or iron compounds. The humus substances produce a gray, brown, or black color, according to the quantity present, while iron, as ferric oxid or hydrate, causes a yellow, brownish, or red color. The coloring power of these constituents depends on the constitution of the soil. In sands 0.2 to 0.3 per cent of humus materials or 1 per cent of ferric oxid or hydrate suffice to cause either a gray or a red or brown coloration in the dry state, but in clays more (2 to 5 per cent humus, 5 to 10 per cent ferric oxid or hydrate) is required to produce the same effect. This is due, as a rule, to more intimate mixture of the clayey soils with the coloring matters. A green coloration is almost without exception caused by ferrous compounds, and is seldom noticed in well aërated soils.

A change in color in a soil is caused on the one hand by a change in humidity, on the other by a change in the iron compounds. In general, soils are darker colored when they contain more water, and *vice versa*. This is especially true of soils containing much humus, which are dark brown or black when wet, become lighter as the moisture decreases, and when dry show a gray or whitish-gray color. Soils colored red or brown by ferric oxid or hydrate assume a lighter color and under certain circumstances (deficiency of air) a greenish color when these compounds are converted into ferrous compounds. The reverse process, *i. e.*, the oxidation of ferrous salts, is shown by an immediate change in the color of the mass to yellow, red, or brown.[2]

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[1] G. Schübler, l. c., p. 61. Meister Programm des Jahresberichtes, 1857-'58 der k. landw. Centralschule zu Weihenstephan, 1. A. von Liebenberg, l. c., p. 6. E. Wollny, Forsch. Geb. agr. Phys., 8, p. 349. E. Ramann, l. c., p. 62.

[2] W. Schumacher, Die Physik des Bodens, 1864, p. 139. E. Ramann, Forstliche Bodenkunde, 1893, p. 36. E. Wollny, Forsch. Geb. agr. Phys., 4, p. 354.

THE STRATIFICATION OF THE SOIL.

The soil, as a whole, is by no means uniform, and this is especially true of sedimentary soils. Different soil layers have a different mechanical constitution, the difference being sometimes very great. Since the individual layers behave differently toward water, air, and heat, the determination of the arrangement of these layers is of particular importance. The stratification may be ascertained by the examination of vertical sections of soil exposed in pits dug at various suitable places or on the surface of columns of soil taken by means of a sampling tube. Information can also be obtained as to stratification of the soil by examining existing exposures, such as railroad and other cuts and excavations.

The upper layer of the soil, containing the roots of plants and altered by vegetable growth, is called "surface soil," while the layer below this is termed "subsoil." The surface soil includes two layers, an upper one or tilled soil, which is artificially altered by tillage, and a lower one influenced only by the growth of plants, and otherwise in its natural condition. We may therefore distinguish between an upper and a lower surface soil. In practical agriculture the term surface soil generally indicates only the upper layer or tilled soil, while the subsoil means the part of the soil below this. The subsoil here begins immediately below the tilled soil, no matter how thick or how thin this may be. The subsoil is sometimes regarded as that layer on whose texture the moisture of the upper layer depends (permeable or impermeable subsoil). A consistent and general terminology does not exist at present, but that suggested above corresponds best with natural conditions.[1]

THE DEPTH OF THE SOIL.

The depth of the soil means the thickness of that part which can be penetrated by the roots of plants. This is of great importance to crops, inasmuch as, within certain limits, they develop proportionately to the thickness of the layer in which they can extend their roots. The depth of the soil, therefore, is determined by the distance below the surface of the layer which prevents the growth of the subterranean organs of the plant. In mountainous districts the depth of the rock below the surface determines the depth of the soil. In level lands the depth of the soil is determined by the distance below the surface of layers of closely compacted materials (clay, rock, bog-iron ore) or of coarse gravel or sand, which prevent more or less completely the growth of the roots on account of their impenetrability, excess of water, or deficiency in the substance necessary to the life of the organs. With regard to the depth of different soils the following gradations may be noticed:

Thin soil	15 to 30 cm.
Medium soil	30 to 60 cm.
Thick soil	60 to 100 cm.
Very thick soil	above 1 meter.

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[1] L. von Liburnan, Die geologischen Verhältnisse von Grund und Boden, 1883, p. 223. A. Nowacki, Practische Bodenkunde, 1892, p. 39. F. Dafert, Kleines Lehrbuch der Bodenkunde, 1885, p. 162. W. Schumacher, l. c., p. 326.

THE POSITION OF THE SOIL.

The surface of the soil is either horizontal or inclined; in the latter case the slope may be uniform or nonuniform, and vary in regard to the points of the compass and in respect to the horizontal. The compass direction is called the "exposure," the slant in respect to the horizontal is the "inclination."

The exposure may be easterly, southerly, westerly, northerly, or may have some intermediate direction. With regard to varying inclination we have the following gradations:

Level or slightly sloping	0 to 5° to the horizontal.
Sloping	5 to 10°.
Very sloping	10 to 20°.
Steep	20 to 30°.
Very steep	30 to 45°.
Precipitous	above 45°.

The exposure and the inclination are of great importance in many ways, because upon them depend the conditions of warmth and humidity of the culture layer, and also of erosion of the soil. The former consideration determines the choice of crop and the latter the possibility of cultivation.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Comparison of methods of sugar analysis as applied to grape juice (musts), G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 326, 327*).—A comparison is given on 3 samples of grape juice of the volumetric and gravimetric methods described in the Proceedings of the Association of Official Agricultural Chemists for 1892.[1] The results by the volumetric method and the electrolytic gravimetric method agreed quite closely, but the method of reducing the cuprous oxid in hydrogen gave results somewhat higher.

The unreliability of the Kjeldahl method for determining nitrogen in chloroplatinates, DELEPINE (*Bul. Soc. Chim. Paris, 13–14 (1895), No. 4, p. 222*).—Trials of this method on chloroplatinate of trimethylamin gave results in no way approaching the theoretical percentages of nitrogen. This was due to the escape of free nitrogen.

Researches on the separation of free hydrochloric acid from chlorids, especially in analysis of the gastric juice, H. LESCŒUR (*Bul. Soc. Chim. Paris, 13–14 (1895), No. 3, pp. 142-155, fig. 1*).

The transformation of starch into sugar, DUCLAUX (*Ann. Inst. Pasteur, 9 (1895), No. 1, pp. 56–64*).—A critical review.

Rapid determination of starch, P. L. HIBBARD (*Neue Ztschr. Rübenz. Ind., 34 (1895), No. 7, pp. 86, 87*).

The action of ammonia upon dextrose, W. E. STONE (*Amer. Chem. Jour., 17 (1895), No. 3, pp. 191–196*).

The carbohydrates of the gum of Acacia decurrens, W. E. STONE (*Amer. Chem. Jour., 17 (1895), No. 3, pp. 196–199*).—This gum "does not essentially differ from gum arabic or peach gum or cherry gum. It furnishes an additional example of the occurrence of a galacto-araban complex."

On the composition and analysis of brandy, X. ROCQUES (*Compt. Rend., 120 (1895), No. 7, pp. 372–374*).

The oxidation of tannin in cider, L. LINDET (*Compt. Rend., 120 (1895), No. 7, pp. 370–372*).—It is claimed, as pointed out by Bertrand (*Compt. Rend., 120 (1895), No. 5, p. 266*), that the brown coloration of the cider and marc is due to the energetic oxidation of the tannin present by a ferment similar to diastase which is designated *laccase*.

The determination of tannin in wines, A. VIGNA (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 19–22*).

On the analysis of tannin compounds, A. GIRARD (*Compt. Rend., 120 (1895), No. 7, pp. 358–360*).—The discordant results obtained by different chemists with the author's method (*Compt. Rend., 95 (1892), p. 185*), are explained by variations in the character of the intestinal membrane used. The difficulty is removed by carefully purifying the membrane.

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[1] U. S. Dept. Agr., Div. of Chem. Bul. 35 (E. S. R., 4, p. 580).

A thermostat, BERLEMONT (*Bul. Soc. Chim. Paris, 13–14 (1895), No. 5, pp. 228, 229, fig. 1*).

An apparatus for grinding peanuts, J. G. W. KEMM (*Neue Ztschr. Rübenz. Ind., 34 (1895), No. 6, pp. 79, 80, pl. 1*).

Some new pieces of chemical apparatus, P. NYSSENS (*Rev. Agron. Louvain, 3 (1894), No. 4, pp. 245–252, figs. 4*).—Descriptions of fat extractor, mechanical agitator, and water bath with constant level.

BOTANY.

The method and application of a quantitative botanical analysis of meadows, A. VOIGT (*Landw. Jahrb., 23 (1894), No. 4 and 5, pp. 707–788, figs. 2*).—The author reviews the methods heretofore employed in making botanical analyses of meadows, and points out some of their deficiencies. The value of botanical analyses as compared with chemical analyses is shown. Chemical analysis of grasses does not always represent the true value of meadows either for pasturage or hay as well as a botanical analysis, as from the latter may be seen the relative value of various species, based on the avidity with which stock will eat them.

The method suggested by the author for securing representative material for a quantitative botanical analysis of an area of 1 are is as follows: Immediately after mowing from each swath at distances of about 50 cm., specimens are taken in proportion to the size and abundance of the material. This forms what is called type 1, and will weigh from 17 to 30 kg., depending on the abundance of the material. This type is then spread about in a circle of 1.5 to 2 meters in diameter until it is of a uniform thickness and of apparent homogeneity. From this circle type 2 is taken, by removing a handful at a time from different parts of the circle until about one fourth of the total quantity is secured. This type is similarly treated to secure types 3 and 4, the final one of which will weigh from 2 to 4 kg. From this last so-called type the botanical determinations are made, a part being retained for control analysis. When strong plants, as thistles, meadow sweet, etc., are present, they must be broken up, so as to permit of a more even distribution of their material. The principal difficulty in such an analysis will be with the grass leaves, such as are found in aftermath. These must be removed, assorted, weighed, and their proportion to the whole ascertained. Their determination is difficult, and should be made by a specialist. The same is true of the sedges, mosses, etc. In this way the species of plants found in a meadow and their relative abundance may be determined with reasonable accuracy.

The author divides the more common grasses into 4 categories, the groups and species being arranged according to their relative value for forage, the first being considered the best, the others decreasing in value according to their position in the list. Group 1, ***Festuca elatior, Lolium perenne, Dactylis glomerata, Arrhenatherum elatius, Avena flavescens, Phleum pratense, Poa pratensis, P. trivialis, Agrostis alba, Glyceria fluitans, G. aquatica,*** and ***Cynosurus cristatus.*** Group 2, ***Festuca rubra,*** *Anthoxanthum odoratum*, *Agrostis vulgaris*, *Briza media*, and *Alopecurus geniculatus*. Group 3, *Holcus lanatus*, *H. mollis*, *Bromus mollis*, *Agrostis canina*, and *Festuca ovina*. Group 4, *Molinia cœrulea*, *Aira cæspitosa*, *A. flexuosa*, *Sielingia decumbens*, *Nardus stricta*, and *Phragmites communis*.

The author has repeatedly tried the above method and considers it much more reliable than any other. The practical application of such an analysis the author considers under 6 heads: (1) Influence of fertilizers and differences between first and second cuttings; (2) a knowledge of the local differences in meadows as bearing on ameliorating conditions; (3) ability of different species to form aftermath, and variations in the same; (4) classification of grasses according to their ability to produce leaves and the causes which influence leaf development; (5) the determination of seed mixtures adapted to certain conditions, and (6) investigation of meadow plants according to their nutrient material, the valuation and duration of meadows and of the meadow land itself.

Contributions from the U. S. National Herbarium, J. N. ROSE (*U. S. Dept. Agr., Division of Botany, Contributions from the U. S. National Herbarium, vol. I, No. 9, pp. 293–434, pls. 13, figs. 10*).—A report is given, containing critical notes and descriptions of new species, of a collection of plants made by E. Palmer in the States of Sonora and Colima, Mexico, during the years 1890 and 1891. The grasses were determined for this report by the late G. Vasey, the ferns by D. C. Eaton, the *Cyperaceæ* by N. L. Britton, the species of the genus *Piper* by C. de Candolle, the *Sapindaceæ* by L. Radlkofer, and assistance was given by others in various groups. An index of this completed volume is given in this number.

The influence of cold on plants—a résumé, C. ABBE.—In 1888 and 1891 Sebastiano Cavallero[1] published his original investigations confirming the results arrived at by German students a few years before as to the effect of frost upon plants. He states that until lately it was supposed that by the freezing of the sap the cells are distended and the tissues torn asunder, and that to this injury the death of the plant must be attributed. In the winter of 1887–'88 he ascertained that the frozen tissues did not suffer any injury, and repeated his observation in 1890–'91. He found that under the action of frost a rupture of the tissues is very rare and that the cells themselves never freeze; that the small crystals of ice are not formed within the cells, but in the intercellular spaces; and that this formation occurs both in the hardy and the delicate plants. It is the chemical changes brought about by frost that are of principal importance. So far as it goes Cavallero's work confirms that of Müller-Thurgau, published first in 1880, and subsequently elaborated and published in 1886. As his conclusions are not yet found in the text-books, it may be stated that in general as the temperature of the plant cools the water exuding from the individual cells leaves a more condensed sap behind and the intercellular spaces are filled with purer water. Owing to capillary phenomena this water is not easily frozen until it has been cooled several degrees below the freezing point, and then its temperature suddenly rises to 32° F., as in the ordinary experimentation of the physical laboratory. The water within the cells is of course not yet frozen, being a more condensed sap, whose freezing point is usually lower than that of pure water. If now the temperature falls still lower, the ice cools, and eventually the sap within the cells may be frozen, but this is rare, and when it happens it does not necessarily tear the cell wall, because the quantity within the cell is not more than sufficient to fill up the space formerly occupied by the water that exuded. If now the plant thaws out, the great mass of intercellular water escapes by transpiration. A little may go back into the cells, but this is a small percentage and oftentimes none. The plant wilts by the rapid loss of this water. Furthermore, a chemical change takes place in the cells by the excretion of pure water, and the cell sap that is left behind constitutes a new chemical compound. Such cells now change their character and their relation to the growth of the plant. Many of the excrescences and the diseases formerly supposed to be due to bacteria, or fungi, or parasites are found to be due to the chemical changes that have taken place within the cells in consequence of freezing. Thus Hartig shows that the frost *krebs*, or excrescence on trees, is a growth due to the effort of the plant to get rid of or cover up the dead cells produced by frost. When a frozen plant is young and tender and its leaves immature, the exudation through its tender cell walls may lie directly on the outside of the cuticle, but as the cuticle hardens in the mature plant, and the development of stomata becomes more complete, the greater part of the exuded water and its resulting ice is in the intercellular spaces. When the frozen plant is thawed out and evaporation is rapid the loss of water either from the surface of the tender plant or through the stomata of the mature plant is much more rapid than under normal conditions and the plant wilts, but when there is no evaporation, the sap has time to return into the cells, and the wilting is not so severe. Therefore it is proper to say that the injury is not done by the more or less rapid thawing, but by the more or less rapid evaporation that accompanies the thawing. If similar plants are thawed out under warm and cold water, respectively, the rate of thawing has no influence on its health, as was shown by Sachs long ago. It is now seen that this is because in both these cases there is no special chance for evaporation, and the sap was able to go back into the cells; the contrary occurs when the plant thaws in the open air.

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[1] Gior. Agr., 1888, Mar. 11; Gaz. Mantova, 1891, Jan. 24.

It is commonly said that those plants and parts of plants which catch the early morning sun and are thawed out rapidly suffer in consequence, but it is now evident that two other factors have a predominating influence, viz, (1) the special evaporation in air and sunshine;

(2) the fact that these parts have, during the previous growth, been daily receiving extra sunshine and have thereby become more turgescent than the shaded portions. This has prepared their cells to suffer more from frost. Kunisch likens the chemical change that the sap undergoes in each cell to the freezing out of cryolites at specific temperatures from ordinary solutions; it is the chemical change that is the real cause of the death of the cells, and if too many cells are killed the whole plant succumbs. Moll shows that the wilting of the frozen leaves is due to the collapse of the cells whose exuded water has frozen in the intercellular spaces.

Sorauer traces the frost *brand* or blight, the frost *krebs* or cancer, the frost *beulen* or boils, the frost *leppen* or patches, and the frost *runzeln* or wrinkles and puckers to a healthy effort of the plant to get rid of or cover up the cells that have been killed by the frost. When a plant is abundantly supplied with warmth and moisture it suffers most from spring frosts; but when it has been retarded in its development, and especially when it is still in its winter stage of vegetative repose, it suffers least. When the autumn and early winter are warm and dry and the tree continues its growth late in the season the subsequent winter freezes are more injurious to it because in general there is more sap in its cells and more cells suffer from the chemical changes produced by the cold. R. Goethe collects a number of facts illustrating this general principle. He recommends that all frost wounds be cut out as soon as perceived and closed up with grafting wax; covering the wounds with clay may sometimes do, but in general fungi develop beneath that. The hot wax or wash with fungicides may kill the wood to the depth of a millimeter, but it preserves the rest. Goethe recommends to strip off the leaves in autumn, to loosen the earth about the roots, to whitewash the branches and trunks with lime and envelop them with straw. Sorauer has especially investigated both the mechanical and chemical injuries and the effects of temporary frosts and of long-continued freezes. Müller-Thurgau in 1886 summed up the experience of others and the thousands of experiments made by himself about as follows: The exudation of the sap from the cells and its freezing outside is the death process. Then the injury is done, the cell is dead from that time forth, but perhaps not the whole plant; no process of thawing will revive the dead cell or dead plant. As a protection against loss by frost he suggests: The proper selection of varieties which, in consequence of their origin, can be considered as able to resist frost; the new development of hardy varieties from such hardy individuals as may be occasionally discovered; the diminution of danger against frost by proper cultivation and nourishment and whatever makes the plant sound and vigorous, as suggested by the various experiences of severe winters; the acceleration of the beginning of the period of vegetative rest (stripping the leaves is considered to be without advantage) and the retardation of development—that is to say, the prolongation of this repose by protecting the plants and the soil from premature warmth. As external protections, he recommends covering the ground around the plants with earth or snow or mulching. He gives special attention to the smudging of the vineyards, with some historical details. We must refer to the original[1] for the many details which he gives as to the treatment of plants that have been injured by frost.

Since 1886 the following additions to our knowledge have been published. In 1886 Wollny[2] summarized our knowledge of methods of cultivation by which to assist cultivated plants in overcoming unfavorable climatic influences, especially frost. He lays principal stress upon the introduction of hardy varieties and shows that these may be developed by selecting the larger seeds. In general the plant has a greater resistance to frost in proportion as the seed from which it was developed is larger. Again, plants from unripe seeds possess a less resisting power to the frost than those from the developed seed. Again, a seed that develops prematurely in the fall has the greatest danger of suffering during the following winter. Finally, the plants stand the frost better in proportion as the seed is buried less deeply, since the seeds that are sown shallow give rise to the most vigorous plants.

Detmer[3] finds that perfectly dry grains and fruits exposed to —10° C. or lower retain their vitality, but that moist fruits and seeds are killed. Ordinary wheat kept at —10° C. loses much of its energy and speed of growth and is enfeebled apparently in proportion to its moistness. He agrees with Sachs that many plants die under rapid thawing that live under slow thawing, but that certain parts of plants die in consequence of freezing alone independently of thawing.

Kny[4] from his experiments as to whether frost acting on the seeds affected the subsequent development of the plant found that seeds of peas, beans, clover, rape, tobacco, and barley, when they were well dried and then divided into 3 groups, (1) those that were frosted, (2) kept cool, and (3) quite warm, and then planted, germinated and developed without any great difference; but seeds that were not well dried were injured by the cold.

Wollny[5] finds that potatoes are less in number and weight when the seed tubers have been long exposed to freezing.

L. H. Bailey,[6] has shown the good influence of wind-breaks in agriculture, including their advantages as a protection against freezing.

Jumelle[7] shows that although plants cease respiring at very low temperatures, yet in the presence of light they can assimilate the carbonic acid gas of the atmosphere at a temperature of −40° C., and that the so-called sleep, or vegetative repose, is due to the drying up of the plant and not to the cold.

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[1] Landw. Jahrb., 15 (1886), pp. 453-609.

[2] Forsch. Geb. agr. Phys., 9 (1886), p. 292.

[3] Ibid., 10 (1888), p. 235.

[4] Ibid., 11 (1888), p. 122.

[5] Ibid., 12 (1889), p. 398.

[6] N. Y. Cornell Sta. Bul. 9 (E. S. R., 1, p. 276).

[7] Forsch. Geb. agr. Phys., 14 (1891), p. 445.

Bliznine[1] shows that the freezing of wheat in a cold but snowless December does much more injury than in February, apparently owing to the early tender stage of growth.

Hartig[2] shows that the temperature under the bark of a tree after the leaves have fallen, and therefore in winter time, may be 50 or 55° C. on the sunny side, while the temperature on the shady side is 15 or 20° less. With this high temperature there comes a stimulated evaporation on the sunny side that separates the bark and kills the tree.

Petit[3] calls attention to the fact that as water in capillary vessels does not freeze until it is cooled down to a temperature far below that of melting ice, so in like manner the water in the soil which is spread in capillary films over each grain of gravel may be cooled to about 15° F. without freezing, but when it does change to ice it suddenly warms up to 32°. For this reason the temperature of the soil cools more rapidly during the nighttime in proportion as the soil is drier. On the contrary, in the summer time, when freezing does not come into play, the soil is warmer in proportion as it is drier.

Prunet[4] finds that on thawing the frozen plant the water is lost by evaporation from the surface rather than by the ordinary operation of transpiration through the stomata or breathing pores.

Schindler[5] in his extensive special studies on the relation of wheat to climate accepts the fact that wheat is less sensitive to frost in proportion as its vegetative period is longer, but thinks that no explanation is as yet known. The dry wheat of the Steppes does better than the moist wheat of western Europe. The power of resisting frost depends ultimately on the specific peculiarities of the protoplasm, about which we know nothing.

The effect of bad seasons on the growth of trees, A. CARY (*Garden and Forest, 8 (1895), pp. 88, 89*).—During the winter of 1893–'94 the author made a study of the so-called year rings of spruce trees, in the course of which the rings of over 1,400 trees in Maine were counted. In all trees of apparently more than 80 years' growth a belt was noticed in which the rings were greatly reduced in size, in some cases being seen only with the aid of a microscope. By reference to meteorological data of undoubted authority it was learned that a series of remarkably cold seasons began in 1812 and culminated in 1816, the years 1812, 1815, and 1816 being the most severe. The record of the effect of these years in the trees is usually represented by a zone of 6 or 7 greatly reduced rings. If each ring represents a year's growth the zone should begin with the seventy-seventh from the bark. In some cases this was found to be true, but more frequently there was a discrepancy of 3 or 4 rings. Counting from the inside of the zone of reduced rings to the bark a similar discrepancy is noted, showing that the number of rings can not be taken as a perfect index of the age of a tree, but shows the number of growth periods, which may be influenced by cold or drought, in which case several rings may be deposited during a single year, or in ordinary seasons an occasional extra ring may be deposited.

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[1] Forsch. Geb. agr. Phys., 15 (1892), p. 122.

[2] Ibid., 16 (1893), p. 64.

[3] Ibid., p. 285.

[4] Ibid., 17 (1894), p. 142.

[5] Ibid., p. 209.

The paths of gaseous exchange between the aërial leaves and the atmosphere, F. F. BLACKMAN (*Proc. Roy. Soc., 57 (1895), No. 342, pp. 165–168*).—On account of the smallness of the quantities of gas involved, the author states that practically no attempt has been made hitherto to determine by direct estimation the question of the path by which carbonic acid passes out of the leaf in respiration and into it in assimilation—whether this takes place by the stomatal openings or through the continuous surface of the cuticle. The existing experimental evidence is all of an indirect nature, and rather tends to support the view that the exchange is a cuticular phenomenon. Barthélemy in 1868 put forth the view that the cuticle was especially adapted for transmitting carbon dioxid from the external air to the assimilating cells beneath. This view he supported by experiments on the artificial osmosis of gasses through leaves. About the same time Boussingault performed experiments that seemed to show definitely that in assimilation the carbon dioxid taken up by the leaf entered it through the upper surface devoid of stomata rather than through the more distant stomatal openings. In support of the view that stomata form the paths of gaseous exchange we have the conclusion arrived at by Mangin in 1888, from diffusion experiments on isolated cuticle, that this diffusion is insufficient to account for the whole gaseous exchange of the leaf. By the aid of an apparatus designed by the author he has been able to estimate successfully the amount of carbon dioxid given out and taken in by the two surfaces of the same leaf under the same conditions. For this purpose shallow capsules 10 sq. cm. in area, consisting of a glass plate with metal rim, through which tubes for the circulation of the air current pass, are employed. Two of them are affixed to a leaf on opposite sides of the same area in air-tight union by means of soft wax. Through these two continuous currents of air can be kept flowing over the two surfaces and the carbon dioxid produced or taken in during a given time by each of them be determined. Numerous experiments on the respiration of a variety of leaves with the stomata all on one side or variously distributed on the two sides agree in showing that the stomata are the site of the exhalation of this gas. When no stomata are present on the upper surface of the leaf then practically no carbon dioxid is exhaled from that surface, while more than thirty times as much may be given off from the lower stomatiferous surface. When stomata occur on both surfaces the relative amounts of the gas exhaled closely follow the ratios of the number of stomata. To prove this the author shows that *Ampelopsis hederacea*, with no stomata on the upper surface, but with many on the lower, exhales carbon dioxid in the proportion of 3:100 for the two sides; in *Alisma plantago* the proportion of the stomata on the two surfaces is as 135:100, and the proportion of the gas exhaled is as 120:100; in *Iris germanica*, with an equal number of stomata on each surface, the proportion of the gas exhaled by the two surfaces is as 110:100; and in *Ricinus communis* the proportion of stomata is as 100:250, and the gas exhaled is as 100:260.

Experiments in the absorption of carbon dioxid during assimilation showed the same close relation to the distribution of stomata. As hitherto carried out, the author considers direct sunshine, continuous for several hours, as essential to the success of these experiments. A very simple experiment of the author's will show that the stomata are practically the sole path of entry of carbon dioxid for assimilation. If part of the lower stomatic surface of any leaf, having no stomata on its upper surface, be coated with wax so as to mechanically block the stomata, no starch can be formed in that area, while adjacent areas may become rich in starch.

The previously mentioned experiments by Boussingault were conducted with the leaves of *Nerium oleander*, the upper surface of whose leaves possesses no stomata. These leaves assimilated less when the upper surface had been coated with wax than when the lower stomatiferous surface had been so coated. The author claims that the explanation of this is due to the fact that Boussingault experimented with the leaves in an atmosphere containing 30 per cent of carbon dioxid, which is greatly in excess of the optimum percentage of carbon dioxid assimilated by this leaf. Under these conditions there penetrates into the leaf so much of the gas that its assimilatory activity is lessened and falls below that of another leaf, into which, owing to the blocking of the stomata, the gas diffuses very slowly and can not exceed the optimum strength.

Further evidence on the possible paths of gaseous exchange has been obtained by investigating the degree to which diffusion of carbon dioxid can be artificially produced through the living leaf. Strong mixtures of the gas were led continuously across one surface of the leaf and the amount which diffused through it was estimated. Other experiments on the respiration of injected leaves also support the view that the stomatal openings, in spite of their minuteness, offer a much easier path from the atmosphere to the interior of the leaf than does the cuticle. The conclusions of the author are as follows:

"(1) Under normal conditions practically the sole pathway for carbon dioxid into or out of the leaf is by the stomata. Since oxygen diffuses more readily than carbon dioxid through fine openings, the same probably holds for oxygen and the whole of the gas exchange.

"(2) Under abnormal conditions, when the stomata or intercellular spaces are blocked and the surrounding tension of carbon dioxid is great enough, passage of carbon dioxid by osmosis through the cuticle may take place.

"(3) That such closure of stomata as is held to take place in darkness does not prevent the distribution of gas exchange closely agreeing with that of the stomata.

"(4) That the exhalation of carbon dioxid in bright light by a leafy shoot in Garreau's well-known experiment is not the expression of any physiological truth for the leaf, but only due to the imperfections of the conditions; to the presence of immature parts, or of tissues not sufficiently green or not fully illuminated. Mature isolated green leaves fully illuminated assimilate the whole of their respiratory carbon dioxid and allow none to escape from them."

The bacteria of the root tubercles of Leguminosæ, M. GONNERMANN (*Landw. Jahrb., 23 (1894), No. 4 and 5, pp. 649–671*).—The author has sought by means of pure cultures, soil investigations, and inoculation experiments to ascertain the probable number of forms of bacteria capable of forming tubercles on the roots of leguminous plants. The methods employed by the author are described very minutely. Plate, gelatin, and potato cultures were made of all forms found in the tubercles of *Lupinus albus*, *L. angustifolius*, and *L. luteus*, and the winter soil was carefully examined to learn how the organism passes the winter. He found in his cultures several forms of *Bacillus* and *Micrococcus*, and claims that those bacteria forming tubercles on the roots of legumes are spore forming, and in this way pass the winter in the soil.

From his experiments the author thinks that there is not so great a necessity for the presence of bacteria for nitrogen assimilation as is sometimes claimed, and that the relationship between the plant and the organism is often one of parasitism rather than of symbiosis.

The author concludes that (1) the tubercles of *Leguminosæ* are not formed by a single specific bacterium, but that in different localities are to be found different organisms capable of producing them; (2) the Y-formed specimens, the so-called bacteroids, are very complex while in symbiosis with the plant, but later upon the dissolution of the tubercles they separate into simple bacilli, and as such they may be found in the surrounding soil. In the spring they enter the plants and form by their growth into new Y-shaped bodies; (3) the symbiotic relationship is not yet completely established, since the tubercle bacteria alone can not make the free nitrogen available for the plant, but it seems more probable that the plant itself without symbiosis can take up and assimilate free nitrogen; the bacteria, however, may assist the plant in contributing to its higher nitrogen content. Further, it is shown that in spite of the presence of bacteria the plants do not take up any greater nitrogen content. From many recent experiments it is shown that not only a symbiotic but also a parasitic relationship exists between the plants and their bacteria, also that the effect of the bacteria and the method of nitrogen assimilation are not well known.

On the presence of alumina in plants and its distribution, BERTHELOT and G. ANDRÉ (*Compt. Rend., 120 (1895), No. 6, pp. 288–290*).—As a contribution to the question of the existence and proportion of alumina in plants the following determinations, among other data, are reported: Carefully washed alfalfa roots, 0.127 to 0.5 per cent of pure alumina; convolvulus roots, 0.0596 to 0.4 per cent; Bermuda grass roots, 0.011 to 0.12 per cent; lupine leaves, 0.013 to 0.037 per cent; linden leaves, 0.0012 to 0.0025 per cent.

These results indicate that alumina is present in considerable amounts in plants with extensive root systems, but that it remains largely in the roots and is found in only minute quantities in the leaves.

Report of the botanist, B. D. HALSTED (*New Jersey Stas. Rpt. 1893, pp. 289–436, figs. 73*).

Synopsis.—The author gives a report on weeds, potatoes grown directly from the cuttings, the solandi process of sun printing, and various fungus diseases (see p. 823).

Report on weeds (pp. 290–312).—The author prepared as a part of the Agricultural College and Experiment Station exhibit at the Columbian Exposition a collection of the most common weeds of the country, which were displayed in wing frames and as an herbarium. A case of 100 weed seeds was also shown. In collecting the material for this exhibit an opportunity was offered for extending the check list of American weeds, a revised list of which is given. This list embraces 817 species, representing 77 orders. An illustrated lecture upon weeds was prepared, a synopsis of which is given.

Potatoes by the direct method (pp. 312–318).—The author's attention was called to specimens of seed potatoes that failed to produce plants. In their stead small tubers were grown from the eyes, and all further development stopped. In a few cases there was a feeble attempt to send up shoots, but in all cases the yield was greatly reduced. Foreign truckers are said to sometimes take advantage of this habit to produce an early crop of potatoes. The reason for this unusual behavior seems to be physiological, and whatever tends to weaken the seed may under adverse atmospheric conditions produce the result given above.

The solandi process of sun printing (pp. 318–323).—This process consists in exposing the subject, necessarily somewhat translucent, to the sunlight in an ordinary printing frame with a sheet of sensitized paper back of it, as in the ordinary way of printing from a negative. This sun print when toned becomes the negative from which the pictures may be printed, a piece of glass being interposed between negative and print. The toning is done with kerosene for both negative and positive. As the object must be translucent, the uses to which this method can be placed are limited, but any object that will allow any light to penetrate may be so photographed if exposed long enough. Leaves, thin sections of wood, rusts, leaf spots, blights, etc., are especially adapted to this process. This method of printing is not new, but the use of kerosene as a clarifying agent is the chief point of interest, as it diminishes the time required for exposure and sharpens the details of the positive picture.

Shrinkage of leaves in drying (pp. 323–326).—Numerous leaves were printed by the solandi process, after which they were prepared for the herbarium in the usual way. A table is given showing that endogens shrink less than exogens, the average of 4 endogens being 18 per cent, with 11 per cent for *Pontederia* and 27 per cent for a *Panicum*, while the average of 7 exogens was 31 per cent in drying, the extremes being 21 per cent for hollyhock and 45 for a catalpa leaf. A study of the outlines shows that leaves shrink most in the region of fewest veins, and the author gives the following law: "Leaves in drying under pressure shrink toward the mass center of their framework."

Botanical work at the Mississippi Station (*Mississippi Sta. Rpt. 1893, p. 47*).—A brief mention of the nature of the botanical work being carried on at the station, which is chiefly devoted to a botanical survey of the State, comprising a collection and study of the flowering plants, and also of the mildews, rusts, smuts, and other parasitic fungi.

A model for a botanical course, G. Haberlandt (*Bot. Centbl., 61 (1895), No. 7, pp. 241, 242*).

On the list of Pteridophyta and Spermophyta of northeastern America as prepared by the nomenclature committee of the Botanical Club, B. L. Robinson (*Bot. Gaz., 20 (1895), No. 3, pp. 97-103*).—The author gives numerous instances in which the rules of the committee do not secure the much desired stability of nomenclature, and advances opinions why their rules will not secure the desired results.

The fundamental difference between plants and animals, C. S. Minot (*Science, n. ser., 1 (1895), No. 12, pp. 311, 312*).—The author holds that plants obtain their food, either liquid or gaseous, by osmosis; and animals in the form of concrete particles which are lodged in the cell protoplasm by the activity of the protoplasm itself. Apparent discrepancies are offered in the case of the Myxomycetes and the tape worm, the one usually classed with plants taking its food by an amœba-like method, the other living as a parasite by absorption.

The plant individual in the light of evolution, L. H. Bailey (*Science, n. ser., 1 (1895), No. 11, pp. 281-292*).—The author discusses bud variation in its relation to Weismannism. He considers the theory of Weismann inadequate to explain bud variation.

What constitutes metamorphosis in botany, A. Mann (*Inaug. Dissertation, Munich, 1894, pp. 40, figs. 25; abs. in Bot. Centbl., 61 (1895), No. 7, pp. 264, 265*).—The author discusses the morphology of sprouts, (*a*) tendrils, (*b*) thorns, and of leaves, (*a*) bud scales, (*b*) phyllodia, (*c*) tendrils, and (*d*) thorns.

The geotropic curving of nodes, R. Barth (*Inaug. Dissertation, Leipzig, 1894, pp. 39; abs. in Bot. Centbl., 61 (1895), No. 10, pp. 364, 365*).

Contraction of trees caused by cold, J. Clayton (*Nature, 51 (1895), p. 462*).—The author gives measurements of 13 trees measured October, 1894, and February and March, 1895, showing a contraction for February, when the temperature was 3° F., varying from $\frac{2}{16}$ to $\frac{6}{16}$ of an inch in circumference.

On the forms of chlorophyll, A. Etard (*Compt. Rend., 120 (1895), No. 6, pp. 328-331*).—The author has separated from afalfa a second form of chlorophyll, the formula of which is $C_{42}H_{63}NO_{14}$.

On the forms of chlorophyll, A. Gautier (*Compt. Rend., 120 (1895), No. 7, pp. 355, 356*).—Remarks on articles by Etard (*Compt. Rend., 119 (1894), p. 219, and 120 (1895), p. 328*). The author states that he (Gautier) showed in 1877 that there were different kinds of chlorophyll in different orders and genera of plants. He had separated the principal chlorophyll of rye grass and spinach in 1886, the formulas for which are given as $C_{30}H_{48}N_2O_3$ for the rye grass, and $C_{40}H_{64}N_2O_4$ for the spinach.

A preliminary investigation of the presence of diastase in plants, J. Gruss (*Ber. deut. bot. Ges., 13 (1895), No. 1, pp. 2-14*).

Root tubercle bacteria, Danckelmann (*Ztschr. Forst. und Jagdw., 27 (1895), No. 2, pp. 90, 91*).

Do plants assimilate argon? E. BLASS (*Nature, 51 (1895), p. 461*).—The note by Blass is answered by W. Ramsey, one of the discoverers of the new element, that experiments are under way by which the question can be answered.

Primitive corn (*Meehan's Monthly, 5 (1895), No. 3, p. 44, fig. 1*).—An account of sexual abnormalism in an ear of corn—the pistillate and staminate flowers mixed.

A new method for investigating the carbonic acid gas exchanges of plants, F. F. BLACKMAN (*Proc. Roy. Soc., 57 (1895), No. 342, pp. 162–164*).—An abstract is given briefly describing a form of apparatus designed to measure small quantities of carbonic acid gas given off by parts of leaves.

Apparatus for physiological botany, W. C. STEVENS (*Bot. Gaz., 20 (1895), No. 3, pp. 89–96, pls. 4*).—Descriptions are given of a centrifugal machine and three forms of clinostats—a horizontal, vertical, and universal clinostat.

Flowers and Insects, XIII, C. ROBERTSON (*Bot. Gaz., 20 (1895), No. 3, pp. 104–110*).—The author discusses the mutual relationship between the flowers of *Dodecatheon meadia, Steironema ciliata,* and *Enslenia albida,* and the insects found to visit them.

Phenological observations in Metz during the years 1891–'94. SCHÄFER (*Jahresber. Ver. Erdkunde in Metz, 16 (1893–'94)*).

ZOÖLOGY.

Monographic revision of the pocket gophers, family Geomyidæ, C. H. MERRIAM (*U. S. Dept. Agr., Division of Ornithology and Mammalogy, North American Fauna, No. 8, pp. 258, figs. 71, pls. 20, maps 4*).—An illustrated monograph of the pocket gophers, exclusive of the genus *Thomomys*, giving detailed technical, anatomical, and systematic descriptions of the various species, with notes on habits. It is divided into introduction, and 4 chapters: General remarks; morphology of the skull; the dental armature, comprising the teeth and the mechanism and dynamics of the cutting machine; and systematic descriptions of the genera and species. The genera *Pappogeomys*, *Cratogeomys*, *Platygeomys*, *Orthogeomys*, *Heterogeomys*, *Macrogeomys*, and *Zygogeomys*, and the following species and subspecies are described as new: *Geomys tuza mobilensis*, *G. breviceps sagittalis*, *G. breviceps attwateri*, *G. texensis*, *G. arenarius*, *G. personatus fallax*, *Pappogeomys albinasus*, *Cratogeomys perotensis*, *C. estor*, *C. peregrinus*, *C. oreocetes*, *C. castanops goldmani*, *C. fulvescens*, *Platygeomys tylorhinus*, *P. planiceps*, *Orthogeomys latifrons*, *O. nelsoni*, *Heterogeomys torridus*, *Macrogeomys dolichocephalus*, *M. costaricensis*, and *Zygogeomys trichopus*.

Pocket gophers and moles, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 108–113*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 389).

METEOROLOGY.

Frost warnings, J. M. SHIRIER (*Proc. Ga. Hort. Soc. 1892, pp. 56–58*).—Brief general note on Georgia weather service and the methods of sending out information as to the approach of frosts. It is recommended that smudges be used for protecting plants from early frosts. Piles of slowly inflammable material, such as green pine butts, are to be made and lighted, at least 4 smudge piles being employed for every 160 acres of ground. It is believed the smudge would be dense enough to envelop surrounding vegetation and protect it from frost, as is done successfully on the prairie lands of Minnesota.

Prediction of night frosts in the spring, C. ROUSSEAU (*Rev. Hort., 67 (1895), No. 3, pp. 71–74*).—The results of observations from March 20 to May 20 during the years 1880–'94 are reported, showing that the average difference between the reading of the wet-bulb thermometer during the afternoon and the minimum thermometer the following night was 4.8° C., thus in a measure confirming the accuracy of Hammermann's statement that frost may be expected if the reading of the wet-bulb thermometer in the afternoon minus 4° is 0 or less. A closer analysis of the results, however, shows that this factor is by no means constant, but depends largely upon direction of the wind, cloudiness, rainfall, etc.

The use of a somewhat larger factor than 4° is recommended as generally safer in practice. In fair weather, with the wind north or northeast, the difference is nearer 7 or 8 than 4°.

Meteorological observations at Berkeley, California, L. E. HUNT (*California Sta. Rpt. 1893 and 1894, p. 362*).—A synopsis of observations for 7 years ending June 30, 1894, on air pressure, temperature, precipitation, humidity, cloudiness, and direction of wind. The summary for the year ending June 30, 1894, is as follows: *Pressure* (inches).—Mean, 30.059; highest, 30.440 (Dec. 28); lowest, 29.682 (Feb. 12); yearly range, 0.758; highest monthly average, 30.183 (December); lowest monthly average, 29.921 (August). *Temperature* (°F.).—Mean of the year, 50.2; mean of the warmest month, 59 (July); mean of the coldest month, 44.2 (January); maximum, 79.5 (April 19); minimum, 31 (January 6); yearly range, 48.5; greatest monthly variation, 40 (April); least monthly variation, 25 (September); mean daily range, 14.4; mean lowest, 47.7; mean highest, 62.1. *Precipitation* (inches).—Total rainfall, 26.650; dew and fog, 0.084. *Humidity.*—Mean relative, 82.8; greatest monthly variation, 52 (November); least monthly variation, 26 (August); maximum, 97 (November 24, 8 a. m.); minimum, 45 (November 17, 8 a. m.); yearly range, 52. *Weather.*—Number of clear days, 163; number of fair days, 93; number of cloudy days, 109; number of foggy days, 107; number of days on which rain fell, 68. *Wind.*—Prevailing direction, southerly.

Report of meteorologist, W. H. BISHOP (*Delaware Sta. Rpt. 1893, pp. 203–217*).—Monthly summaries of observations at 6 stations in the State on temperature, pressure, and rainfall are given. A summary of temperature and rainfall observations for the year 1893 is given in the following table:

Annual summary of meteorological observations in Delaware.

	Newark.	Middletown.	Dover.	Milford.	Seaford.	Millsboro.
Temperature (°F):						
Highest	97.00	96.00	101.00	95.00	97.00	97.00
Lowest	− 9.00	− 5.00	− 6.00	− 9.00	− 5.50	− 17.00
Mean	50.90	51.30	52.50	53.80	53.60	53.50
Rainfall (inches), total	36.29	41.15	42.10	40.45	40.62	44.02
Number of days on which 0.01 inch or more of rain fell	87	91	92	94	89	101

The mean temperature was slightly lower than for the past 3 years. The hottest days were June 20 and July 26, the difference in temperature between the two being very slight. The coldest day was January 17. The rainfall for the year is slightly below the average, the greatest deficiency occurring in June. Damaging storms occurred August 23 and 24 and October 13 and 14. The first killing frost occurred October 17.

Meteorological summary (*Mississippi Sta. Rpt. 1893, p. 62*).—The results of observations during 5 years (1889–'93) on temperature and rainfall are tabulated. The following summary is taken from the tables reported:

Meteorological summary for Mississippi, 1889–'93.

	1889.	1890.	1891.	1892.	1893.
Temperature (°F.):					
Maximum	97.00	96.00	97.00	96.00	[1]99.00
Minimum	15.00	19.00	19.00	13.00	[2]9.00
Mean	62.90	64.90	63.60	62.50	62.90
Rainfall (inches)	44.96	55.05	61.17	59.78	40.17
Number of rainy days	78	94	84	101	86

[1] July. [2] January.

The average yearly rainfall for the 5 years was 52.23 in., the highest average monthly rainfall being 7.11 in. in July, the lowest 1.03 in. in October.

Protection from night frosts, S. LEMSTRÖM (*U. S. Patent No. 525989, Sept. 11, 1894*).—An account of the method of protection for which this patent is issued has already been noted (E. S. R., 5, p. 660).

Meteorology (*Arkansas Sta. Rpt. 1894, pp. 51, 52*).—A reprint from Bulletin 26 of the station (E. S. R., 5, p. 1070).

Meterological observations at Newport and Camden, Arkansas, G. B. IRBY and F. H. CLARKE (*Arkansas Sta. Rpt. 1894, pp. 86, 114*).—Daily summaries, April to October, 1893, of temperature and rainfall observations at Newport and summaries of similar observations for each month of 1893 at Camden.

Monthly Weather Review (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 22 (1894), Nos. 7 and 8, pp. 273–350; charts 8*).—These numbers are devoted to the usual topics.

Periods in temperature, H. A. HAZEN (*Amer. Met. Jour., 11 (1895), No. 11, pp. 416–418, dgm. 1*).—Summations of temperature fluctuations over the whole United States during 27-day periods in the 9 colder months of the year are projected in a diagram. "There is absolutely no period established in these cases."

The occurrence of cold days (*Nature, 51 (1895), No. 1322, pp. 416, 417*).—The maxima for 50 winters at Greenwich are tabulated and discussed and maxima not over 32° F. are charted.

New relations between the movements of the barometer on the northern hemisphere and the movement in declination of the sun and moon, P. GARRIGON-LAGRANGE (*Compt. Rend., 120 (1895), No. 6, pp. 342, 343*).

Variations in the rainfall in European Russia, E. A. HEINZ (*Bul. Acad. Imp. Sci., St. Petersburg, ser. 5, vol. 2, No. 1, pp. 49–54, pls. 2*).

Harrington's rainfall charts—a review (*Science, n. ser., 1 (1895), No. 12, p. 319*).

A new form of barometer, J. N. COLLIE (*Jour. Chem. Soc. London, 1895, Feb., pp. 128–132, fig. 1*).

WATER—SOILS.

The cienegas of southern California,[1] E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 185–188*).—"A *cienega*, in the parlance of the native Californian, is a limited area showing a growth of water-loving plants, appearing sporadically in otherwise arid surroundings—usually hillsides or valley margins—and occasionally giving rise to flowing springs." The cienegas of the San Antonio, Santa Ana, and Mill creeks, and of the Temescal Valley, are described and their value as sources of water supply discussed.

"While they do not render the establishment of artificial storage reservoirs superfluous, they do supplement them locally to a very material extent, rendering it possible to occupy for agriculture large areas that otherwise would have remained arid for many years to come.

"But there arises the question as to the geographical limits within which these natural storage reservoirs may reasonably be sought, for it is notorious that they are not usually found, and the name and idea of the cienega is not generally known in the northern portions of California.

"The essential condition of cienega formation is manifestly the opportunity for the abundant formation of deposits of exceptionally coarse and pervious gravel and cobbles near the points where the canyons emerge from the mountains. This, again, is necessarily conditioned upon the occasional occurrence of violent, torrential rainfall in the mountains, alternating with periods when quiet deposition allows of the formation of water-shedding layers. Another condition appears to be the ready weathering of the parent rocks into rounded forms, by which close packing is prevented, so that abundant interspaces are permanently maintained. Both conditions are fulfilled to an unusual extent in the granitic ranges of southern California."

Investigations in soil physics, R. H. LOUGHRIDGE (*California Sta. Rpt. 1893 and 1894, pp. 70–100, dgms. 2*).—The results of examinations of a large number of different soils made at intervals during the past 15 years at the California Station are summarized in this article, "in order to draw as far as possible some conclusions, either positive or negative, as to the relation of the various sediments or ingredients to the power possessed by soils to absorb hygroscopic moisture, to their capacity for holding water, and to their power of transmitting water by capillarity." A somewhat detailed discussion is given of the influence of physical constitution and chemical composition of the soil on its hygroscopicity, especial attention being given to the influence exerted by clay; the methods and results of studies of the water-holding capacity of different soils, and the rapidity, height, and extent of the capillary rise of water in soils of different character subjected to different treatment.

The general conclusions drawn are as follows:

"(1) The power possessed by soils of absorbing moisture from the atmosphere and to hold water within their pores is not proportionate alone to the amount of combined surface presented by the particles of the soil; and while, as a very general class, soils with large percentages of clay and fine silts have a high moisture and water capacity coefficient, such materials by no means control that power, simply because of large surface area; for even in the small number of soils represented in the above analyses there are many which, though having very high clay percentages, are low in their moisture and water coefficient, and *vice versa*.

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[1] Read at the meeting of the Geological Society of America at Washington, August, 1891.

"(2) There are in the soil certain chemical compounds (zeolites, ferric, silicic, and aluminic hydrates and humic compounds), which are highly hygroscopic and absorptive in themselves, and are held almost exclusively by the clay in greater or less amounts. The proportion of these, singly or conjointly, seems to have a greater, if not a controlling, influence over that power than the mere amount of clay and fine material, as such.

"(3) The upward movement of water in soils is controlled in rapidity by the proportion of coarse material; and the limit in height to which water will rise by capillarity is dependent upon the amount of fine silt and clay. The extreme height reached thus far, under the most favorable conditions, is 50 in., even after several months. In sandy soils the limit was less than 18 in.

"(4) The presence of alkaline salts in a soil produces a puddling or deflocculation of the particles when wet, and a consequent compact condition, which prevents the rapid rise of water. This puddling is accompanied by large contraction of volume, a feature which to a far less degree has been observed in other soils. On the other hand there are some soils (adobes and certain ferruginous clays), which, when wet, expand quite considerably, because of the swelling of the colloidal particles.

The amount and kind of soluble salts present in different portions of an alkali spot, from the center to the circumference, C. Colemore and E. W. Hilgard (*California Sta. Rpt. 1893 and 1894, pp. 140–145*).—Tabular statements of analyses showing the amount and composition of the alkali salts taken at 5 different distances from the center of an alkali spot are reported and discussed. It was observed that there was a more or less regular decrease in the amount of the alkali salts toward the margin, beyond which normal vegetation would thrive. In this case the maximum amount "found to be compatible with ordinary (weed) vegetation was 0.23 per cent, or a little less than a quarter of 1 per cent of total soluble salts, of which, however, one third was carbonate of soda and nearly another third common salt, or nearly 0.08 per cent of the soil of each." It has been observed, however, that this amount of carbonate of soda in an adobe soil is sufficient to prevent the growth of any useful plant. "It is therefore obvious that the mere determination of the amount of total salts present in a soil is not sufficient to determine its fitness or unfitness for crop growth. It is essential that the nature and proportion of the different salts present should be determined before a definite judgment can be had."

The analyses show further that the alkali containing the highest amount of carbonate of soda also contained the largest proportion of organic matter; that the per cent of soda steadily increased from the margin toward the center, while the reverse was true for potash; that carbonic acid and phosphate increased from the circumference toward the center; that chlorin decreased from the margin toward the center, while the proportion of nitrates was greatest at a point about halfway between the margin and center.

Reclamation of alkali land with gypsum at the Tulare Station, C. H. Shinn and E. W. Hilgard (*California Sta. Rpt. 1893 and 1894,* *pp. 145–149, pls. 3*).—This is an account of a continuation of experiments described in the Report of the Station for 1891–'92, pp. 80–'90 (E. S. R., 5, p. 569), the treatment tried in the earlier experiments on a small scale (¼-acre plat) on underdrained soil being extended to a larger area (¾ acre), which had not been underdrained, but had had the hardpan broken up by blasting.

"The total amount of gypsum used upon the acre now under treatment is 3,000 lbs. Only 625 lbs. has gone on the first one fourth acre, which was underdrained. This was at the rate of 1¼ tons to the acre. The plats on which blasting powder was used have required 2,375 lbs. of gypsum, or at the rate of nearly 3,200 lbs. to the acre, and are not yet as far reclaimed as the first plat. They will probably require half a ton more to yield wheat and barley at the rate of last year's crop on the smaller plat. The gypsum is evidently distributed more evenly and therefore more effectively by the method of underdraining, where the conditions are similar to those that prevail at the Tulare Station. . . .

"The cultures attempted in the spring of 1892 were more varied than before, embracing beets, corn, sorghum, cereals, grasses, clovers, and some garden crops. Most of these were sown in short rows near the middle of the plat, and the rows received a special application of gypsum to better protect the seed. Results showed the effect of the underdrains; the nearer the plants stood to the line of a drain the better they grew. While many cultures failed entirely, there was much to encourage hopefulness. Sorghum and Egyptian corn in some cases grew 6 or 7 ft. high, and yielded heavily. Close beside such plants as these were others hardly 3 in. high, pigmies of the same age, stunted by the alkali. A few barley plants were normal, but most of them when headed out were only 3 or 4 in. high. It was evident that the leaching of the plat had been very uneven, owing to the hardness of the soil; and most of the gypsum used in 1892 was used upon the spots where the alkali still remained strongest. . . .

"On the three fourths of an acre where blasting powder had been used . . . the leaching proceeded more slowly than on the first plat, but good progress has been made, and another season a fair crop of wheat and barley can be expected."

A new simple method of determining lime in arable soils, A. DE SAPORTA (*Compt. Rend., 120 (1895), No. 4, pp. 215–217*).—A known weight of the soil to be examined is dropped into a measured quantity, say 200 cc., of hydrochloric acid of known specific gravity (1.1 at 15° C.), and after solution is complete the increase in specific gravity of the acid is determined. It is claimed that in experiments with pure marble the increase in specific gravity was directly proportional to the amount of marble used, and so in examining soils the readings of the hydrometer may be taken as indicating the amount of lime dissolved. Results obtained by this method and by Bernard's calcimeter on 4 samples of soil show close agreement. The merit of extreme simplicity claimed by the author for his method appears to be about the only one it possesses.

Comparison of the action of hydrochloric and oxalic acids in soil extraction, M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 63–65*).—Two soils, a black adobe and a reddish sandy soil, were each digested in porcelain beakers for 5 days in the usual way in hydrochloric acid of 1.115 sp. gr. and oxalic acid of a corresponding strength.

The hydrochloric acid extract was analyzed in the usual manner.

"In the case of oxalic treatment, the solution was immediately filtered from the insoluble residue; the filtrate evaporated to dryness in a platinum basin, ignited to expel the excess of oxalic acid, and the resulting residue dissolved in hydrochloric acid and treated as usual."

"[The results] show that, on the whole, hydrochloric acid exerts a stronger influence on the soil than does oxalic acid, as in both sets of analyses it is noticed that the insoluble residue is, in the case of the hydrochloric acid digestion, about 2 per cent lower than is that resulting from the action of oxalic acid.

"The amount of potash (0.73 for the adobe and 0.47 for the sandy soil) dissolved is identical in the two treatments, while the quantity of lime extracted by hydrochloric acid is about twice that yielded by the oxalic acid, as is indicated by the figures 1.15 and 0.62 for the adobe soil, and 0.97 and 0.41 for the sandy. As regards magnesia, there is very little difference.

"The percentages of iron and alumina are both lower when oxalic acid is used as the solvent. . . .

"In summing up we might say that, except in the case of lime, the results obtained by the action of oxalic acid on soils could receive the same interpretation as that given to those derived from the hydrochloric acid treatment."

Digestion of soils for analysis, E. W. HILGARD and M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 61–63*).—In order to ascertain whether the acid commonly used in soil analysis undergoes change of strength in digestion on the steam bath, "50 cc. of hydrochloric acid, of 1.116 sp. gr., obtained by the distillation of the last two thirds of stronger acid under atmospheric pressure, was evaporated on the steam bath to one half its bulk. The same, diluted with 10 per cent of water, was similarly treated. Furthermore, the same experiment was made with 2 porcelain beakers ('soil pots') covered with watch glasses, being kept on the steam bath for 5 days, as usually practiced by us in soil digestion. In the latter two cases, the bulk had been reduced to 36 cc., or by somewhat over one fourth of the original volume."

The results were as follows:

Effect of evaporation on the strength of hydrochloric acid of 1.116 specific gravity.

	Strength of acid (anhydrous hydrochloric acid).		
	Original.	Evaporated to one half its bulk.	Evaporated to 5 cc.
	Per cent.	*Per cent.*	*Per cent.*
Desk acid in open beaker	22.96	21.49	20.96
Desk acid with 10 per cent water	20.67	21.49	....
Desk acid in covered porcelain beaker	22.96	21.49	....
Desk acid, with 10 per cent water, in covered porcelain beaker	20.67	21.49	....

"It will thus be seen that under the ordinary conditions of digestion, as heretofore practiced in this laboratory, the changes arising from evaporation are absolutely insignificant, in comparison with those unavoidably resulting from the variable amount of soluble matters in different soils."

Analyses of water and remarks on water supply, M. E. JAFFA, M. CURTIS, and E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 157–184*).—**Analyses of a large number of samples of stream, lake, spring, well, and artesian water are tabulated and discussed.**

The influence of geological-agronomical charting upon soil study, T. WOELFER (*Fühling's landw. Ztg., 44 (1895), No. 2, pp. 42–49*).

Crops and fertilizers, with reference to California soils and practice, E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 200–213*).—A popular article discussing the draft of different crops on the soil and means of restoring exhausted fertility.

The relations of soils to climate, E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 100–139*).—A partial and revised reprint of Bulletin 3 of the Weather Bureau of this Department (E. S. R., 4, p. 276).

Fig soils, M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 235–240*).—A reprint of an article published in Bulletin 102 of the station (E. S. R., 5, p. 286).

On the nitrogen contents of soil humus in the arid and humid regions, E. W. HILGARD and M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 66–70*).—A reprint of an article in Agl. Sci., 8 (1894), No. 4, pp. 165–171 (E. S. R., 6, p. 197).

Analyses of alkali (*California Sta. Rpt. 1893 and 1894, pp. 149–156*).—Reports of examinations of 22 samples of alkali leachings, crusts, and soils.

Analysis of two Kentucky blue-grass soils, M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 65, 66*).—The results of analysis of 2 samples of Kentucky soils sent out by the reporter on soils and ash of the Association of Official Agricultural Chemists are tabulated and discussed. Attention is especially called to the high percentages of phosphoric acid, 0.71 and 0.40 per cent. The only soils having amounts approaching these figures are the black waxy soils of Texas, with 0.59 per cent, and basaltic soils of Montana, with 0.59 per cent.

Analyses of rocks, clays, marls, etc. (*California Sta. Rpt. 1893 and 1894, pp. 189–191*).—Brief reports of analyses of marl and clay rock, calcareous rock, cement, peat, borate of lime, and brine; and a list of minerals sent to the station for examination.

Analyses of soils (*California Sta. Rpt. 1893 and 1894, pp. 47–61*).—Mechanical analyses and in most cases chemical analyses of 3 samples of soil from the Sierra Foothills, 7 from the Great Valley, and 4 from the Coast Range are tabulated and discussed, and lists of a large number of samples subjected to partial examination are given.

Analyses of Malmesbury soils, C. F. JURITZ (*Agl. Jour. Cape Colony, 8 (1895), No. 4, pp. 76, 77*).—A continuation of systematic determinations of water, organic and volatile matter, chlorin, lime, potash, and phosphoric acid in the soils of Cape Colony. For previous analyses of soils of the Durban and Koeberg districts see same journal, Jan. 11, 1894, p. 5. Determinations of nitrogen are in progress and soil maps and charts are in course of preparation.

Progress in the culture of sandy soils in the last 15 years, B. MARTINY and A. ORTH (*Jahrb. deut. landw. Ges., 9 (1894), pp. 511–539*).

Reclaiming coast sands, C. B. MCNAUGHTON (*Agl. Jour. Cape Colony, 8 (1895), No. 2, pp. 57–65, figs. 14; No. 3, pp. 57–59, figs. 6; No. 4, pp. 91–96, figs. 6*).—An account of the methods used on the sand dunes of Gascony, France.

FERTILIZERS.

Green manuring with cowpeas and other crops (*New Jersey Stas. Rpt. 1893, pp. 146–150*).—This article gives the plan of an experiment for the improvement of light lands by the use of crimson clover and cowpeas, and a statement regarding the method of cultivating cowpeas on a large scale in New Jersey. Cowpeas, following crimson clover, yielded at the rate of 14,400 lbs. of green material per acre. The vines contained 2,278.1 lbs. of organic dry matter, 70.6 lbs. of nitrogen, 17.3 lbs. of phosphoric acid, and 50.4 lbs. of potash. The roots on 1 acre weighed only 1,080 lbs. and contained 295.2 lbs. of organic dry matter, 4.2 lbs. of nitrogen, 1.5 lbs. of phosphoric acid, and 4.4 lbs. of potash per acre. The roots and vines grown on an acre contained a total of 34.8 lbs. of nitrogen, 18.8 lbs. of phosphoric acid, and 54.8 lbs. of potash. The nitrogen in the vines is equivalent to that contained in 437½ lbs. of nitrate of soda, and is valued at about $11.

Report of pot experiments with phosphates, W. H. BISHOP (*Delaware Sta. Rpt. 1893, pp. 193–202, figs. 2*).

Synopsis.—In comparative tests of soft Florida phosphate, crude iron and alumina phosphate, concentrated iron and alumina phosphate, and acid phosphate, combined with nitrate of soda and muriate of potash on soja beans grown in 3 series of pots containing (1) 16 lbs. of clayey soil, (2) 20 lbs. of sandy soil, and (3) 20 lbs. of ground quartz, the first two phosphates gave no increase in crop; the last two increased the yields equally.

The soft Florida phosphate used contained 28.81 per cent of insoluble phosphoric acid, the "raw ground rock" (iron and alumina phosphate) 36 to 38 per cent of insoluble phosphoric acid, the concentrated phosphate (of iron and alumina) 38 to 40 per cent of available phosphoric acid and 49 to 50 per cent of total phosphoric acid, and the acid phosphate 15 per cent of phosphoric acid. These were each applied, at rates furnishing the same amounts of phosphoric acid, in combination with muriate of potash and nitrate of soda, in 3 series of galvanized iron pots containing different kinds of soil, viz, a clayey soil from the station grounds (16 lbs. per pot), a sandy soil from near Dover, Delaware (20 lbs. per pot), and ground quartz (20 lbs. per pot). In case of the sandy and clayey soils an additional pound of sand was added to the surface of each pot. For comparison some of the pots received gypsum alone and combined with muriate of potash and nitrate of soda, and others received no fertilizer. The soils were carefully mixed and sifted and the fertilizers thoroughly incorporated with them. Soja bean was the plant used. The pots were watered when it seemed necessary, the amount of water applied at each watering being 70 per cent of that which the soil would hold at saturation. The tabulated data show for each series the kind and amounts of different fertilizers applied, the water added, and the yields of stems (without leaves) and beans on each duplicate plat and the average yields.

The conclusions reached were as follows:

"(1) Soft Florida phosphate and 'raw ground rock' (iron and alumina phosphate) gave no increase in the crop.

"(2) 'Concentrated phosphate' gave as good results as acid phosphate.

"(3) When a full supply of water is added to soil that is already in a fair state of fertility the differences in the crop produced by the addition of fertilizers, even in large quantities, are not very great."

Methods of preparing phosphates of alkalies from phosphates of lime and iron, E. A. SCHEIDER (*Chem. Ztg., 19 (1895), No. 10, Repert., p. 34; Ztschr. angew. Chem., 1895, No. 4, p. 109*).—The following method is applicable to natural phosphates of lime, Thomas slag, and phosphates rich in iron oxid. The phosphate is dissolved in sulphuric acid, which is used in large excess when the iron content is low. In this case the excess of sulphuric acid is saturated with iron hydrate which is obtained as a by-product in a subsequent stage of the process. To the solution of phosphate of iron in sulphate of iron thus obtained water is added, which precipitates a considerable portion of the phosphate of iron. The solution remaining is used for the decomposition of another portion of phosphate, additional sulphuric acid being added to it. The phosphate of iron obtained is decomposed with potash solution, or if an apparatus for dialysis on a large scale is provided an ammoniacal solution of the phosphate of iron may be dialyzed to the point where the phosphate of ammonia disappears and the undecomposed residue of phosphate of iron is then treated with potash solution.

The solubility of basic slag, C. H. RISDALE (*Chem. News*, *71* (*1895*), *No. 1838*, *pp. 82*, *83*).—In this paper, read before the Cleveland Institute of Engineers January 14, 1895, the author criticises Wagner's conclusions regarding the relation between citrate solubility, silica content, and fertilizing value of slags (E. S. R., 6, p. 625). He especially dissents from the expression of results in terms of percentage solubility.

Investigation showed that tetrabasic phosphate of lime, whether natural or artificial, was completely dissolved in Wagner's citrate solution, and "that increased quantities of poorer slags, containing the same quantity of soluble phosphoric acid as richer varieties, and which should, when treated with fixed quantities of solvent (as would under actual agricultural conditions be the case), yield an equal amount [of phosphoric acid], do not, but yield much less." It was also shown that "the alleged close relation between the silica content and the percentage solubility had almost as many exceptions to the rule as examples of it, and that there was a point beyond which the higher the silica the less the solubility."

A study of the conditions influencing solubility lead to the following conclusions:

"The percentage solubility depends on—

"(1) The actual content of phosphoric acid, varying inversely to it.

"(2) The neutrality or freedom from excess of lime (and possibly certain other bases).

"(3) Silica does not *per se* increase this, but only (*a*) when it combines with and thus neutralizes excess of lime, and possibly certain other bases; (*b*) when as a condition of the presence of a large quantity of silicate of lime (which silicate appears not to interfere with the solubility in the quantities in which it is generally present) there is only a low total percentage of phosphoric acid present.

"(4) Silica decreases this when present in quantities greater than required in 3, or sufficiently large to bring about the formation of silicates of iron or manganese.

"(5) Excess of oxids of iron and manganese have a very small effect, almost negligible when compared with that of lime, the actual solubility being the resultant of the inert action of such of these conditions as are present.

"The absolute solubility, or actual amount dissolved, depends on the actual content of phosphoric acid, varying directly with it, and in other respects following 2, 3, 4, and 5."

Fertilizer inspection and analyses in New Jersey (*New Jersey Stas. Rpt. 1893, pp. 17–103*).—This includes statistics of the fertilizer trade in 1893 and 10 preceding years; data as to the market prices of fertilizers; remarks on the economic purchase and rational use of complete and incomplete fertilizers, and on formulas, composition, and cost of home mixtures; and tabulated analyses of 405 samples of fertilizing materials, including nitrate of soda, sulphate of ammonia, dried blood, dry ground fish, cotton-seed meal, wool waste, cotton hulls, ground bone and tankage, bone, acid phosphate, dissolved boneblack, bone ash, South Carolina rock, and other mineral phosphates, Odorless Phosphate (slag), muriate of potash, kainit, sulphate of potash, sulphate of potash and magnesia, ashes, factory-mixed fertilizers, and home mixtures.

The price of complete fertilizers declined from 1885 to 1893, but this decline "was not accompanied by a corresponding decrease in the absolute amounts of plant food delivered to consumers." The use of fertilizers in the State is increasing, their cost amounting to $1,641,615 in 1893 as against $1,509,921 the previous year.

"Farmers can make mixtures which are equal to the best manufactured brands and superior to the average—first, in mechanical condition; second, in concentration; third, in quality, and fourth, in point of cost.

"Many farmers' clubs and granges are now buying their [fertilizing materials in bulk and doing their own mixing] and several transactions by such organizations this year, which involved the purchase of 700 tons of materials, were carefully studied by the station in order to show the actual gains that were made. The 700 tons cost $20,790, or on an average at the rate of 14.9 cts. per pound for nitrogen, 5.7 cts. per pound for available phosphoric acid, and 4 cts. per pound for potash. The average cost per pound of these fertilizer elements, bought in mixed goods from dealers, is this year 24.8 cts. for nitrogen, 9.4 cts. for available phosphoric acid, and 6.7 cts. for potash. The total cost of the amounts of constituents contained in the 700 tons would, on this basis, have been $34,489, or a difference in favor of the former method of $13,699, on a transaction which represents less than one thirtieth of the total annual consumption in the State. This study also showed that if the average manufactured fertilizer had contained as much plant food as was contained in the mixtures made from the 700 tons of materials purchased, the total amount used in 1892 would have been contained in 23,172 tons, instead of 33,821 tons, or a difference of 10,649 tons. A comparison of the selling price and valuation of the mixed goods examined this year shows further that the cost to the farmer for mixing, bagging, and selling averaged $9.70 per ton, or a total for the 10,649 tons of $93,295. That is, the labor connected with the handling and selling of 10,000 tons of absolutely worthless materials amounted to nearly $100,000.

"In buying manufacturers' mixtures distinct advantages in quality and cost are secured when bought direct from the manufacturers instead of from local agents."

Fertilizers, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 40–43*).—A summary of Bulletin 29 of the station (E. S. R., 6, p. 395).

The use of human excrement as a fertilizer, J. H. VOGEL (*Deut. landw. Presse, 22 (1895), No. 8, pp. 66, 67; No. 10, pp. 83, 84; No. 11, p. 92*).

The cause of the relatively incomplete utilization of the nitrogen of stable manure, P. WAGNER (*Deut. landw. Presse, 22 (1895), No. 11, pp. 91, 92; No. 12, pp. 98, 99, figs. 15*).

The loss in the fertilizing value of stable manure when exposed, G. CATANI (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 60–67*).

Management of farmyard manure (*Agl. Jour. Cape Colony, 8 (1895), No. 2, p. 40*).—General comment, including a brief description of methods pursued by the Longerenong Agricultural College, Australia.

Experiments in conserving stable manure by covering it with earth, A. GRILLI (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 68–74*).

Practical experience concerning the effect of stable manure in the light of recent investigations, P. WAGNER (*Deut. landw. Presse, 22 (1895), No. 14, p. 123*).

The nitrogenous fertilizers of commerce, C. DUSSERRE (*Chron. Agr., 8 (1895), No. 5, pp. 102–105*).—Brief general statements.

A study of the agricultural value of the phosphate of alumina of Grand-Connétable, A. ANDOUARD (*Compt. Rend., 120 (1895), No. 6, pp. 337–339*).—This phosphate was compared with other mineral phosphates, including Algerian, Somme, South Carolina, and Florida phosphates in pot experiments on balsam, flax, white mustard, and buckwheat, with results indicating that it may be profitably used in untreated condition. More complete field experiments are stated to be in progress.

On the agricultural value of the phosphates of alumina—remarks on the previous note, A. GAUTIER (*Compt. Rend., 120 (1895), No. 7, pp. 356–358*).—Recounts 3 years' field experiments on a large scale with Redonda and Connétable (Guana) phosphates, which confirm Andouard's conclusions as to the high assimilability of such phosphates, but it is maintained that this high assimilability is confined to those phosphates indirectly resulting from fermentation of nitrogenous matter, and generally in an amorphous or indistinctly or partially crystallized condition.

Preparation of a fertilizing material containing citrate-soluble phosphoric acid, O. PEIPER (*Chem. Ztg., 19 (1895), No. 11, p. 221*).—A patented process in which fine ground iron or aluminium phosphate is stirred into a hot solution of lime in soda or potash.

Fertilizers and gypsum (*California Sta. Rpt. 1893 and 1894, pp. 192–200*).—Analyses of 3 samples of fertilizers and 37 samples of gypsum or gypseous earths, with accounts of gypsum mines located near Mendota, Fresno County, and in San Benito County, California.

Field experiments on white mustard with nitrogen in green manures and barnyard manure, J. KÜHN (*Ztschr. landw. Cent. Ver. Sachsen, 1895, No. 1, pp. 4–12*).

Manure in its relations to plant evaporation, C. D. REED (*Amer. Agr., (middle ed.), 1895, Feb. 23, p. 194*).

Analyses of commercial fertilizers, T. J. EDGE and W. FREAR (*Pennsylvania State Bd. Agr. Bul., Jan. 1, 1895, pp. 24*).—Text of the act regulating the manufacture and sale of commercial fertilizers in Pennsylvania; schedule of trade value of fertilizing ingredients, with notes on valuation; and tabulated analyses and valuations of 342 samples of fertilizing materials, including ground bone, acid phosphate, and mixed fertilizers.

FIELD CROPS.

Experiments with corn, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 18–23*).—These consisted of variety tests and fertilizer experiments. The largest yields in 1889 were made by Mosby Prolific, St. Charles Parish, White Dent, Improved Leaming, Welborn Conscience, and Piasa King; in 1890 by Mosby Prolific, Cock Prolific, Minter Prolific, Bailey, Mammoth Surprise, and Evans. In 1889, 1890, and 1892 the white varieties yielded more than the yellow varieties.

"As a rule the yellow varieties make larger ears, but we have found very few which average more than 1 ear to the stalk. Of those varieties noted as being the best 6, the white varieties averaged 127 ears to 100 stalks, while the yellow varieties bore only 105 ears to 100 stalks. . . . It is probably true that the yellow varieties stand up better in the field and are less liable to rot when left in the field until late in the season."

The results of fertilizer tests varied according to the soil on which the crop was grown. In 1889, on a very heavy dry clay soil, 500 lbs. of fresh cotton seed gave the largest yield. In 1890 and in 1891 the most profitable fertilizer was a compost of stable manure, cotton seed, acid phosphate, and kainit. In 1892, on a heavy red clay soil from which the surface soil had been badly washed and which had given a light crop of lespedeza the preceding year, 240 lbs. of cotton-hull ashes gave the largest yield, an increase of 123 per cent over the yield of the unfertilized plats. In 1893, on a heavy soil which had grown a crop of cowpeas in the preceding year, 500 lbs. of kainit to the acre more than doubled the yield of the unfertilized plat. Results of fertilizer tests at Holly Springs are also stated.

"From the work which has been done both at Holly Springs and at the home station, there seems to be no great difference between the fertilizers required for corn and those which are most needed for cotton. The first essential for both is evidently an abundant supply of humus, which can be provided most economically by the plowing under of green leguminous crops, but which may be supplied in stable manure, cotton seed, or [cotton-seed] meal With a soil rich in humus and in lime, potash should be used liberally, while but little phosphoric acid and no nitrogen need be given. Where lime is deficient both potash and phosphoric acid should be used, and if deficient in humus, nitrogen should also be applied in the form of [cotton-seed] meal for sandy soils and [cotton] seed for heavy clay uplands."

Experiments with cotton, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 6–17*).

Synopsis.—The results of 5 years' work in fertilizer tests in 3 localities and of variety tests are summarized. Fertilizer tests indicate that the soil of the station farm is especially benefited by manures or fertilizers rich in organic matter and potash. At the Holly Springs Substation results were not decisive. At the Lake Substation phosphoric acid proved superior to potash. The value of the crop for the 6 varieties affording the greatest value per acre (in lint and seed) in each of the 5 years of the experiment are given and the results for 1893 are tabulated in full.

Fertilizer experiments (pp. 6–13).—At the station in 1889 200 lbs. of kainit per acre proved the most effective and economical fertilizer. In 1890, on a similar soil, the Furman compost (containing 750 lbs. of stable manure, 750 lbs. of cotton seed, 333 lbs. of acid phosphate, and 167 lbs. of kainit per ton) proved most economical, though sulphate of potash afforded nearly the same yield.

In 1891, on an exhausted, dry, yellow clay hill the best results followed the use of 1,000 lbs. of cotton seed per acre; on a heavy red clay soil 15 tons per acre of stable manure produced the largest yield, while kainit gave the cheapest increase in crop; on an exhausted yellow loam the substitution of kainit for the acid phosphate in the Furman compost largely increased the yield and cheapened the cost of production both in 1891 and 1892. Again in 1893 a compost rich in potash gave a larger yield than one relatively poor in this ingredient and rich in phosphoric acid; 500 lbs. of kainit alone increased the yield by 222 lbs. of seed cotton per acre, while 250 lbs. of acid phosphate alone produced no notable effect.

> "All of the soil used for this work at the home station has been rich in lime and very poor in humus. From the work which has been done here during the last 5 years, the results have been quite uniform, and indicate very plainly that for such soils the first work in restoration must be the providing of a liberal supply of humus, which may come from either stable manure, cotton seed, or the plowing under of green leguminous crops, and that any additional fertilizers used should be rich in potash, though they need contain but little phosphoric acid."

At Holly Springs results for the different years do not accord.

> "So far as can be seen from the work done, the upland clay soils of that region will be fertilized most economically by the use of either [cotton seed] meal or compost to furnish vegetable matter and nitrogen, and to these should be added both phosphoric acid and potash, more of the latter than the former being needed. For the sandy valley lands cotton-seed meal seems the best foundation for the fertilizer, and to that should be added more phosphoric acid than potash, though both are needed."

At Lake, in the pine woods region, the average yields of seed cotton per acre on a sandy clay loam containing but little lime were as follows:

Average yields per acre of seed cotton for 3 years.

Fertilizer.	Yield of seed cotton.
	Pounds.
Nothing	614
35 bu. cotton seed, or 200 lbs. cotton-seed meal 200 lbs. kainit	846
35 bu. cotton seed, or 200 lbs. cotton-seed meal 200 lbs. acid phosphate	1,253
35 bu. cotton seed, or 200 lbs. cotton-seed meal 200 lbs. acid phosphate 200 lbs. kainit	1,105
50 bu. cotton seed 400 lbs. acid phosphate 200 lbs. cotton-hull ashes	1,169
100 bu. cotton seed 200 lbs. acid phosphate 200 lbs. cotton-hull ashes (2 years)	1,249

Variety tests (pp. 13–17).—The most profitable varieties were as follows:

Varieties of cotton producing the greatest value per acre in lint and seed.

1889.

Ferrell Prolific.
Truitt Premium.
Jones Long Staple Prolific.
Excelsior.
Dickson Improved.
Truitt Improved Prolific

1890.

King.
Southern Hope.
Extra Early Carolina.
Truitt Premium.
Tennessee Gold Dust.
Texas Wood.

1891.

Eureka.
Texas Storm Proof.
Allen.
Drake Cluster.
Bailey.
Willis.

1892.

Warren.
Jones Long Staple Prolific.
Drake Cluster.
King.
Smith Standard.
Truitt Premium.

1893.

Cook.
Poor Man's Friend.
Truitt Premium.
Dickson Improved.
Warren.
Bates Big Boll.

"Of the so-called varieties we have a very large number, but of what may be called 'types' there are but 4 which are so distinct as to be generally recognized. These are the Cluster and Long-Limbed, the Long Staple and the Short Staple, and in each of those we have many inconstant 'varieties' which change their character with every change of soil.

"In comparing varieties of the 'long-limbed' and the 'cluster' types we have found no constant differences in the yields, though the cluster varieties have always matured later than have some of the long-limbed sorts; while a long-limbed variety which produces unusually large bolls always matures later than do most of the cluster varieties. . . .

"With nearly 100 so-called varieties which have been tested, the average yield of the short-staple sorts has been nearly double that of the long staples."

Neither Japanese, Peruvian, nor Egyptian varieties proved valuable on the station farm.

Cowpeas, H. N. STARNES (*Georgia Sta. Bul. 26, pp. 163–185, figs. 85*).—Experiments conducted on cowpeas in 1894 consisted of fertilizer tests, variety tests, and a comparison of badly discolored, slightly discolored, and perfect seed. The main purpose of the fertilizer experiment was to determine the relative values of Florida soft phosphate and superphosphate, alone and in different combinations. The following is the author's summary:

"(1) It is money thrown away to apply any form of nitrogenous fertilizer to the cowpea. . . .

"(2) The use of potash salts in large quantities is unprofitable, and even in small quantities will not pay in the oak and hickory region of the South. On other than oak and hickory lands small doses may prove profitable in conjunction with acid phosphate, and the longer the land has been in cultivation the greater becomes this probability, even in the oak and hickory belt.

"(3) Heavy applications of any form or combination of fertilizers are unprofitable.

"(4) The moderate use of phosphates [alone] appears still to return the best results from an economical standpoint.

"(5) As between superphosphate (acid phosphate) and Florida soft phosphate (unacidulated ground rock) results indicate decided preference for the former, so far as the growth of vines is concerned.

"(6) There is less difference observable between the two in the formation of peas, though superphosphate still appears to be preferable.

"(7) The finely pulverized condition of soft phosphate is a great objection to its use, rendering it extremely difficult to handle without loss.

"(8) There is not a sufficient difference in price between the two forms of phosphate to render soft phosphate at present an active competitor to acid phosphate, unless the ascertained results were more emphatic in its favor. . . .

"(9) The quantity of acid phosphate which may be safely depended upon differs, of course, with the character of the land. The better the soil (in its mechanical composition as well as in its chemical contents) the greater the amount that may be profitably used. A range of from 200 to 400 lbs. per acre will probably cover all contingencies."

The 46 varieties grown at the station in 1894 are described and figured. Cowpeas are classified according to the form of the pea, habit of growth, time of maturity, color of pod, color of peas, size of pod, and size of peas. Two forms of cowpea are described, the Crowder and Kidney types. In habit of growth the varieties are classified as follows:

"*Trailing:* Conch, Red Eye, Williams Hybrid.

"*Recumbent:* Calico, Congo, Large Lady, Lilac Red Pod, New Era, Pony, Red Crowder, Red Ripper, Saddleback, Small Lady, Smith No. 7, Smith No. 9, Smith No. 14, Speckled Crowder, Sugar Crowder, Vacuum, White, White Brown Hull, White Crowder, White Giant.

"*Semi-Recumbent:* Black, Black Eye, Blue Hull, Chocolate, Constitution, Everlasting, Forage or Shinny, Granite, Gourd, Mathews, Mush, Purple Hull Crowder, Redding, Red Yellow Hull, Rice, Shrimp, Smith No. 15, Taylor Prolific.

"*Erect:* Clay, Coffee, Quadroon, Red, Unknown, Whippoorwill, Wonderful."

In time of maturity the classification is as follows:

"*Very Early:* Chocolate, Congo, New Era, Vacuum, White Giant.

"*Early:* Granite, Red Crowder, Red Eye, Red Yellow Hull, Saddleback, Smith No. 9, Whippoorwill.

"*Medium:* Coffee, Large Lady, Lilac Red Pod, Mush, Pony, Small Lady, Smith No. 7, Smith No. 15, White, White Brown Hull.

"*Late:* Black Eye, Everlasting, White Crowder, Williams Hybrid.

"*Very Late:* Black, Blue Hull, Calico, Clay, Conch, Forage or Shinny, Gourd, Mathews, Purple Hull Crowder, Quadroon, Red, Redding, Red Ripper, Rice, Shrimp, Smith No. 14, Speckled Crowder, Sugar Crowder, Taylor Prolific, Unknown, Wonderful."

The yields of vines and of peas for each variety are tabulated.

The following are the author's conclusions:

"(1) The earliest cowpea, and hence the variety best adapted to high latitudes, is the New Era; this matures in a little more than 60 days from time of planting. Other very early varieties are Congo, White Giant, Chocolate, and Vacuum.

"(2) The heaviest yielder of vines is Red Ripper, followed closely by Forage or Shinny, Black, and Unknown.

"(3) The heaviest producers of peas are Unknown, Calico, Clay, and White Brown Hull.

"(4) The yield of peas, as a rule, though not invariably, parallels the yield of vines.

"(5) For hay, the erect varieties are preferable to those of a recumbent habit, since the mower cuts them all. The best of the erect varieties are the Unknown, Clay, and Whippoorwill.

"(6) Where a dense mass of vines is wanted to remain all winter on the ground, Calico, Gourd, Black, and Constitution are preferable.

"(7) The best table peas are Sugar Crowder, White Crowder, Mush, Large Lady, Small Lady, and Rice.

"(8) The best stock pea for field grazing of either cattle or hogs is the Black. It will remain in ground all winter without injury. Everlasting, Red, and Red Ripper are also good.

"(9) For an 'all purpose' pea the Unknown leads the list. Clay, however, closely contests first place. Unknown and Wonderful are identical."

Neither the germinating power nor the subsequent growth was lessened by discoloration of the peas used as seed.

Experiments with cowpeas and crimson clover, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 7–13*).—Silage made of cowpea vines was relished by cows and largely increased the flow of milk. In a fertilizer test 160 lbs. of muriate of potash per acre doubled the yield of cowpea vines; nitrate of soda largely increased the yield, but acid phosphate exercised no marked effect. The varieties Unknown and

Conch failed to ripen seed, but the Black cowpea yielded at the rate of 25 bu. of seed per acre when fertilized with muriate of potash. Heavy seeding of cowpeas, by using all the tubes of a grain drill, is recommended.

Italian rye grass sown with crimson clover produced sufficient seed after the first cutting to reseed the land.

Crimson clover straw moistened with water which had been sweetened with low-grade molasses was successfully used as a substitute for hay in feeding cows.

The yield of wheat was largely increased by plowing under a crop of crimson clover in May and a crop of cowpeas in September.

Experiments with oats, G. LIEBSCHER (*Jahrb. deut. landw. Ges., 9 (1894), pp. 453–510*).—These experiments with varieties extended over 5 years and were conducted in numerous localities in Germany. On averaging the yields for 5 years of a number of varieties grown on different classes of soils, it was found that whenever a variety was productive as compared with other varieties on one class of soil it was relatively productive on all other soils. The author states that there is no foundation for the claim that one variety ranks high in yield on one class of soils but low on another.

However, when a variety was originated and the seed grown on one kind of soil it proved more productive (relative to other varieties) on similar soil than on that of a different character. On light soil seed grown on light soil was more productive than seed grown on heavy soil. Seed grown on heavy soil showed a preference for heavy soil.

Varieties originating in a region with a continental climate were most successfully grown in a similar climate; those originating in a marine climate were most productive under similar climatic conditions.

As in previous years varieties did not differ in their percentages of nitrogen and phosphoric acid; these percentages, however, were influenced by the character of the soil on which the crop was grown, by the fertilizers used, and by the weather.

Peanuts, culture and uses, R. B. HANDY (*U. S. Dept. Agr., Farmers' Bul. 25, pp. 24*).—The following subjects are treated: Description and history, composition, with analyses of food and fertilizing constituents in different parts of the plant, varieties, climate and soil adapted to the peanut, manuring, preparation of the land, selection of seed, planting, tillage, harvesting, and uses. A crop of 60 bu. (1,380 lbs.) of peanuts, together with 2,000 lbs. of hay, total 3,380 lbs., is estimated to contain 84.71 lbs. of nitrogen, 14.80 lbs. of phosphoric acid, 32.30 lbs. of potash, and 46.30 lbs. of lime. If the soil for peanuts does not contain lime this should be applied as a fertilizer, together with phosphoric acid and potash. A rotation suggested for peanuts is as follows: Peanuts, followed in the fall by winter rye or oats, and the next summer the land sown to crimson clover, to be followed the next year by peanuts again, so that every other year peanuts will be the crop. Care in the selection of seed is urged. Analyses show that peanut hay and peanut cake have a high feeding value.

Originating varieties of potatoes, G. LIEBSCHER (*Jahrb. deut. landw. Ges.*, *9* (*1894*), *pp. 303–318*).—The theory and history of plant breeding are discussed at some length. Modern potato breeders select as parents 2 varieties which in most qualities bear close resemblance to each other, avoiding the use of opposites. Their aim is to secure as much similarity as possible in most of the qualities of the parents, attempting to fix one characteristic at a time.

This is somewhat in contrast with earlier practice, in which varieties differing widely were crossed. As an instance of the advantages of the modern method, which gives a smaller amount of variation in the seedlings produced, one potato breeder stated that under the earlier system he sometimes grew annually several thousand seedlings, only 1 per cent of which was worthy of a second year's trial, while by crossing varieties similar in most qualities as many were secured by growing only 300 to 500 seedlings, of which 50 to 70 per cent usually proved worthy of further trial.

Breeders no longer expect to get certain qualities from the female parent and certain others from the male.

The interrelation of different qualities is not well known, but it has been noted that a variety having few thick stalks affords only a small number of tubers, which are large; one having numerous slender stalks bears numerous tubers, which naturally remain small. Violet-colored stalks indicate colored tubers; white flowers generally, but not always, accompany white tubers. Early ripening and resistance to disease are not generally found together. A large production of true seed is believed to go hand in hand with a small production of tubers.

Whether or not the time of ripening of a variety can be changed by selection and by varying the time of planting is a mooted question among potato breeders.

In pollenizing varieties artificially the stamens should be removed from the female parent with fine pinchers just as the bloom opens, and the flower inclosed in a paper or gauze bag. The proper stage for applying the pollen is indicated by the moist appearance of the stigma. The pollen from the desired variety should be dusted on the stigma on 2 or 3 successive days, so as to make sure of fertilization. The bag is removed as soon as the stigma dries and the bloom withers.

The seeds are washed out from the ripe seed balls, dried, and at the proper season sown shallow under glass. The seedlings are first transplanted in a hotbed, and later the strongest plants are placed in a rich bed out of doors. The distance between the seedlings varies from 12 by 12 in. to 26 by 26 in. The old rule that in the first year the seedlings should produce tubers of the size of a hazelnut, in the second year of walnut size, and normal tubers not before the third year is no longer applicable. In one instance a seedling produced the first year tubers weighing about 200 gm. (over 7 oz.).

The tubers produced by each plant are kept separate. Those of the best plants are used for propagation the following year, the distance allowed by some breeders in the second year being only 25.6 by 12.8 in., by others 40 by 40 in. Close planting is sometimes advocated as affording the conditions under which the plant is in future to be grown on a large scale. Wide planting permits of easier observation of each plant, is less subject to errors arising from an irregular stand, and is the method favored by the author. The best stocks are planted in the third year on areas of 20, 50, or 100 square meters, are given the usual field culture, and compared in yield and qualities with well-known varieties. It is usually 5 years before there is obtained a type so fixed and valuable as to serve for future crossing and to deserve a name.

Fertilizer experiments on Irish potatoes (*New Jersey Stas. Rpt. 1893, pp. 120-124*).—Experiments on twentieth-acre plats were conducted in Gloucester County on a sandy, well-drained loam of medium fertility, and in Somerset County on a gravelly clay loam with good drainage. Three hundred and twenty pounds of boneblack, 160 lbs. of muriate of potash, 240 lbs. of sulphate of potash, and 200 lbs. of nitrate of soda were used in various combinations. Stable manure was used alone at the rate of 20 tons per acre, and at the rate of 10 tons per acre in combination with half the above amounts of commercial fertilizers. On 2 plats the quantity of commercial fertilizers was 50 per cent greater than that indicated above. The following table gives the cost of fertilizers per acre, the value at 75 cts. per bushel of salable crop after deducting cost of fertilizers, and the value of the increase after deducting cost of fertilizers:

Financial results per acre from the use of stable manure and chemical fertilizers on Irish potatoes.

	Cost of fertilizer.	Gloucester County.		Somerset County.	
		Net value of crop.	Net value of increased crop.	Net value of crop.	Net value of increased crop.
Unfertilized	....	$31.50	....	$54.38	....
Stable manure alone	$10.00	71.01	$39.51	38.75	—$15.63
Stable manure and chemical manure	39.26	84.65	53.15	46.14	— 8.24
Complete chemical manures alone	15.10	71.24	39.74	82.12	27.74

In the first experiment both chemical fertilizers and stable manure were used with profit; in the second experiment only chemical fertilizers returned a profit.

Ramie, W. C. STUBBS (*Louisiana Stas. Bul. 32, pp. 1127–1146*).—The possibilities of ramie culture, the character of the ramie plant and fiber, the draft made on the soil fertility by ramie, and machines for preparing ramie fiber are treated at length. The data relative to the composition and fertilizer requirements are quoted from Bulletin 94 of the California Station (E. S. R., 3, p. 371).

The ramie plant is perennial and yields from 8 to 15 tons of green unstripped stalks per acre. Ramie may be decorticated either when the stalks are green or dry. In the humid climate of Louisiana the fiber should be prepared from green stalks. Some machines are adapted to working ramie dry, others to working it green, and a few claim to work the stalks either green or dry.

In the fall and winter of 1894 a committee tested at the station 3 decorticating machines. One of the machines decorticated 1,000 lbs. of freshly cut unstripped stalks in 1 hour 5½ minutes, and the fiber produced when dried weighed 56 lbs. In another test this machine decorticated 500 lbs. of green unstripped stalks in 24 minutes, yielding 30½ lbs. of dry fiber.

Another machine decorticated 112 lbs. of dried ramie stalks without leaves in 2 hours 11 minutes, during which time the machine was in actual operation only 52¾ minutes; the product was 30 lbs. of fiber. In another trial 380 lbs. of green ramie stalks, stripped (equal to 655 lbs. of unstripped stalks), were decorticated with saturation in 50 minutes; the product was 25¼ lbs. of dry fiber. In other tests, green unstripped stalks were decorticated at the rate of 825.9 and 1,200 lbs. per hour.

A smaller machine decorticated dry ramie stalks at the rate of 322 lbs., and green unstripped stalks at the rate of 960 lbs. per hour.

One of the machines delivered the fiber in a somewhat tangled condition and left a piece of adherent wood at the end of each fiber. Another machine required too much power. The outlook for obtaining a successful ramie machine is regarded as promising.

Fertilizer experiments with salt grass (*New Jersey Stas. Rpt. 1893, p. 137*).—Nitrate of soda alone and in combination with superphosphates and muriate of potash failed to increase the yield of the salt grass (*Juncus geraldi*).

Experiments with wheat, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 23–25*).—Several varieties of English and French wheat were grown at the station. The English varieties failed; the French varieties, White Naples and Rieti, proved valuable. The average yield for 3 years of wheat grown on prairie or creek bottom soil was 21.3 bu. per acre. A crop of wheat and of corn was grown on the same field within 12 months, one variety of wheat yielding 24.1 bu. per acre, and the corn yielding 26 bu. per acre.

The best fertilizer for wheat on a gray loam, somewhat sandy, was a mixture of 400 lbs. of acid phosphate, 250 lbs. of kainit, and 400 lbs. of castor pomace per acre. This mixture increased the yield 131 per cent.

Wheat, barley, oats, rye, and spelt, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 393–397*).—Tabulated data give the time of ripening and of cutting, length of straw and ear, yield of grain and of straw, and brief notes on the character of growth and grain for 64 varieties of wheat, 17 of barley, 12 of oats, 5 of rye, and 6 of spelt. The largest yield of wheat was made by California Spring wheat, followed by Clawson, Imperial Circassian, and Jonquil. The largest yields of rye were made by Department of Agriculture No 2 and Department of Agriculture No. 6. The most productive variety of oats was White Wonder. Excelsior Winter and St. John's Day rye gave the largest yields of grain, Spanish Double-Bearing and St. John's Day the largest yields of straw. The most productive variety of spelt was White Silesian.

A rotation for dairy farms (*New Jersey Stas. Rpt. 1893, pp. 151, 152*).—A rotation intended to furnish a continuous supply of green fodder was begun in 1893, and the plan was as follows: First year, field corn, seeded to crimson clover in July or August; second year, crimson clover, followed by fodder corn and the land seeded to rye after the corn; third year, rye fodder, followed by oats and peas, seeded to red clover and timothy; fourth year, hay.

Species of agave and their industrial utility, R. ROLAND-GOSSELIN (*Bul. Jour. Soc. Cent. Agr. Alpes-Maritimes, 35 (1895), No. 1, pp. 17–21*).

German and American red clover, O. BURCHARD (*Mitt. deut. landw. Ges., 1895, No. 2, pp. 15–17*).

Crimson clover (*New Jersey Stas. Rpt. 1893, pp. 153–155*).—Brief statements concerning the crops grown on 3 farms in different sections of the State.

Corn, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 61–67*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 215).

The chemistry of the cotton plant (*Mississippi Sta. Rpt. 1893, pp. 50–52*).—A brief report of work already published in Technical Bulletin 1 of the station (E. S. R., 4, p. 719).

Cotton, potatoes, and vegetables, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 392, 393*).—Several varieties of cotton and 16 of potatoes were grown. Neither potatoes, carrots, nor turnips proved successful. Other plants grown were watermelons, cucumbers, gourds, snap beans, garden peas, and tomatoes. Tomato vines, protected late in autumn "with lath frames," were kept alive and growing through frosts as low as 26° F., but a temperature of 19° killed the vines.

Cotton, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 70–72*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 215).

Preparation of soil for cotton, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 100–103*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 402).

Cowpea hay, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 73–79*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 215).

Flax, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 27, 28*).—Several varieties of flax were grown at the station, but the yield was too small for the crop to be profitable.

Forage plants, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 79–83*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 215).

Experiments with grass and clover, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 127–136*).—A reprint from Bulletin 29 of the station (E. S. R., 6, p. 531).

Grasses and forage plants, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 28–30*).—Conclusions are given drawn from experiments detailed in Bulletin 20 of the station (E. S. R., 4, p. 248) and Farmers' Bulletin 18 of the U. S. Department of Agriculture (E. S. R., 6, p. 294).

Grasses and forage plants, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, p. 393*).—A number of the forage plants failed to germinate and others were killed by drought and north winds. The following species were successfully grown: Japanese rye grass, Hungarian brome grass, *Digitaria sanguinalis*, velvet grass, perennial rye grass, redtop, teosinte, *Phalaris media*, canary grass (*P. canariensis*), *Lotus tetragonalobus* and *Melilotus alba*.

Hay from barley, wheat, and oats, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 374, 375*).—Tabulated data and notes on the yield of hay at the Foothills Substation.

A comparison of black Siberian lupines with other species, C. SCHRAPE (*Fühling's landw. Ztg., 44 (1895), No. 3, pp. 80–82*).—This excelled in yield and contained a smaller amount of alkaloids than other species.

Black medick (Medicago lupulina), E. WILCZEK (*Chron. Agr. Cant. Vaud, 8 (1895), No. 4, pp. 82–84*).—At Zurich black medick from Germany gave a larger yield of forage, produced larger leaves and seeds, and proved hardier, but was later in reaching maturity than seed from Germany.

Experiments with flat pea, sachaline, and Trifolium pannonicum, E. WILCZEK (*Chron. Agr. Cant. Vaud, 8 (1895), No. 2, pp. 24, 25*).—Ordinary meadow mixtures exceeded in productiveness flat pea aged 1, 2, and 3 years; on dry, rocky declivities the latter proved valuable. Sachaline is not commended. *Trifolium pannonicum* is hardy and productive, but makes only a slow growth.

On the composition of certain French and foreign oats of the crops of 1893, BALLAND (*Compt. Rend., 120 (1895), No. 9, pp. 502–504*).

The origin of the potato (*Rev. Scientif., 3 (1895), ser. 4, No. 8, p. 258*).

Variety tests of potatoes, H. PETTWEILER (*Deut. landw. Presse, 22 (1895), No. 12, pp. 102, 103*).

The best varieties of potatoes, VON ECKENBRECHER (*Jahrb. deut. landw. Ges., 9 (1894), pp. 290–303*).—A report on prize varieties.

The influence of the removal of the lateral eyes of the seed tubers upon the growth and productiveness of the potato plant, E. WOLLNY (*Forsch. Geb. agr. Phys., 17 (1894), No. 5, pp. 461–473*).

The second crop of Irish potatoes, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 96–100*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 409).

Potato culture, (*Amer. Agr. (middle ed.), 1895, Feb. 16, Feb. 23, Mar. 2, Mar. 9, Mar. 16, pp. 164, 196, 221, 252, 281*).—This is a series of articles based upon the results of a "potato contest" in 1889 and 1890, and giving general conclusions relative to soil, preparation, fertilization, seed potatoes, varieties, and cultivation.

Experiments with rye, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 90–93*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 411).

Sugar beets (*New Jersey Stas. Rpt. 1893, pp. 155–157*).—A brief statement of the method of cultivating sugar beets in Cape May County, and analyses of 8 varieties of sugar beets.

The sugar content of sugar beets which have developed seed stalks, G. DE MARNEFFE and O. CASTEELS (*Ingén. Agr. Gembloux, 5 (1895), No. 8, pp. 351–354*).

Effect of manuring beets and other roots with potash salts (*Deut. landw. Presse, 22 (1895), No. 9, pp. 74, 75*).

Sugar beets and sugar cane, M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 218, 219*).—Analyses of sugar beets from 4 localities and of 1 sample of sugar cane are tabulated.

The nitrogen content of sugar cane, LOOKEREN-CAMPAGNE (*Deut. Zuckerind., 20 (1895), p. 22; abs. in Chem. Ztg., 19 (1895), No. 10, p. 28*).

Sorghum and sugar cane, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 25, 26*).—Brief notes on varieties of sorghum grown at the station in 1889 and 1890, and on a fertilizer test for sugar cane.

Sorghum, perennial cotton, sugar cane, and cereals, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 419, 420*).—Brief references are made to all of these crops cultivated at the Southern California Substation. Perennial or Catacaos cotton bloomed in November and December and was killed to the root by light frosts. Reference is made to the special value of a tract of moist land belonging to the substation and a list of grasses sown in 1893–'94 is given.

Notes on culture of tobacco in Virginia, R. H. GAINES (*Southern Planter, 56 (1895), No. 3, pp. 107, 108*).—Continued.

Fertilizers for tobacco, H. J. PATTERSON (*Southern Planter, 56 (1895), No. 3, pp. 109, 110*).—A summary of results of experiments, particularly those of the Maryland station, already reported in Bulletin 26 of that station (E. S. R., 6, p. 209).

Wheat, barley, and sorghum, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 410, 411*).—The yields of 13 varieties of wheat are tabulated. Himalaya barley, an early and productive variety tested at the station, is recommended as a profitable variety for hog raisers. Nepaul barley, which is beardless, has large and heavy heads and palatable straw and is highly recommended for hay. The report contains a brief note on sorghum.

Fertilizer experiments with wheat, A. PASQUINALI and A. SINTONI (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 27–42*).

Varieties of winter wheat, F. HEINE (*Deut. landw. Presse, 22 (1895), No. 6, pp. 47, 48*).

Experiments with wheat, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 115–126*).—A reprint from Bulletin 29 of the station (E. S. R., 6, p. 538).

Late crops for overflow land, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 53–61*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 212).

Rotation experiments, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 68–70*).—A reprint from Bulletin 27 of the station (E. S. R., 6, p. 217).

HORTICULTURE.

Electro-horticulture, F. W. RANE (*West Virginia Sta. Bul. 37, pp. 27, figs. 9*).—Detailed notes on experiments for testing the effect of incandescent electric light on plants grown in greenhouses. Incandescent lamps were used in preference to arc lights even in opal globes, as giving a much steadier and cheaper light, casting no sharp shadows. The experiments were carried on during the seasons of 1892–'93 and 1893–'94, 3 greenhouses being used for the purpose. The light was furnished by one 16-candlepower lamp and by a cluster of 7 lamps of the same strength, which could be used in various combinations. Usually the light was turned on during the entire night. Lettuce, endive, beets, radishes, spinach, cauliflower, and various ornamental plants were selected to be used in the experiment, the choice being partially governed by those already tried under the arc light. The same varieties used were also planted in an ordinary greenhouse unlighted at night as a check.

Of lettuce the varieties Grand Rapids, Hanson, and Tennis Ball gave, respectively, one sixth, one fourth, and one eighth greater yield by weight in the lighted house than that grown without the aid of electricity. Spinach and cauliflower also made an improved growth in the lighted house, but beets and radishes made a smaller growth in both houses. In 1893–'94 peas and beans were also planted, and, while irregularities in subirrigation affected the results with the beans, the peas proved better in the lighted house. Radishes, on the contrary, this year were far better in the dark house, earlier, with smaller tops and larger roots; but it is believed that a greater amount of moisture in the dark house was an important element in the difference. Various potted ornamental plants blossomed earlier under light.

The experiments are given in detail and illustrated from photographs showing various plants at different stages of growth in both the light and dark houses.

A résumé is given of experiments with electric light elsewhere, especially those of L. H. Bailey at the Cornell Station.

The following summary is given:

"(1) The incandescent electric light has a marked effect upon greenhouse plants.

"(2) The light appears to be beneficial to some plants grown for foliage, such as lettuce. The lettuce was earlier, weighed more, and stood more erect.

"(3) Flowering plants blossomed earlier and continued in bloom longer under the light.

"(4) The light influences some plants, such as spinach and endive, to quickly run to seed, which is objectionable in forcing these plants for sale.

"(5) Proper watering appears to be more important with radishes, beans, and cuttings than improper watering and the electric light.

"(6) The stronger the candlepower the more marked the results, other conditions being the same.

"(7) Most plants tended toward a taller growth under the light.

"(8) It is doubtful whether the incandescent light can be used in the greenhouse from a practical and economic standpoint on other plants than lettuce and perhaps flowering plants, and at present prices it is a question if it will pay to employ it for even these.

"(9) There are many points about the incandescent electric light that appear to make it preferable to the arc light for greenhouse use."

Report of the horticulturist, M. H. BECKWITH (*Delaware Sta. Rpt. 1893, pp. 132–152*).—This contains remarks on the testing of tomatoes and strawberries, notes on raspberries, determination of the vitality of peach seed, and pollination of the peach.

Notes are given on 63 varieties of tomatoes and 94 of strawberries, with the dates of ripening, and in the case of the latter of blooming, also. In addition, special comparative notes are given for the majority of the varieties tested. The Older and a new seedling black raspberry were tested, as also the Japanese wineberry, which is considered very productive and of excellent quality.

In response to inquiries on the subject, the question of some method for determining the vitality of peach seeds, either by the appearance or some other means requiring less time than actual germination, was taken up, and suspicious seed and a circular letter were sent to a number of nurserymen believed to be authorities on the subject. The responses received from 14 correspondents are given, showing great variance of opinion. Plump, aromatic kernels are considered the freshest, but the germination test is regarded as the most reliable one.

In an experiment to test the self-pollenizing powers of different varieties of peaches, 493 unopened blossoms of 12 varieties were covered with paper bags during the blooming season, the number varying in the different varieties. Of these, 16 set fruit. The 4 varieties, Fox, Oldmixon, Smock, and Wager, set 1 fruit each, while Crawford Early set 2, and Moore Favorite, 10.

An experiment begun with cross-pollination of peaches in a private orchard was not satisfactorily reported upon and was therefore inconclusive.

Experiments with fertilizers on asparagus (*New Jersey Stas. Rpt. 1893, p. 146*).—Notes on the growing of the variety Barr Mammoth on 3 acres of sandy loam, manured with commercial fertilizers. The plants were set in 2½-ft. rows, and a mixture of nitrate of soda, ground bone, boneblack, superphosphate, and potash applied along the rows in April. In May a second application was made. The experiment is to determine the profits to be gained by the best cultivation and most careful manuring.

Fertilizer and canning test of sugar corn, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 21, 22*).—Notes on an inconclusive and unfinished investigation as to the best method of obtaining the largest possible crop of sugar corn of the most desirable quality and the largest possible tonnage of fodder in keeping with the crop of ears and its quality. The varieties Stowell Evergreen and Zig-Zag were employed in the experiment, in which 24 plats were manured with different combinations of fertilizers. At the close of the experiment a case of corn from each of the plats was packed in a cannery and tested by experts as to its commercial value. The experiment is to be resumed.

Sweet potatoes, H. N. STARNES (*Georgia Sta. Bul. 25, pp. 127–161, pl. 1, figs. 35*).

Synopsis.—Experiments conducted at the station in 1893 and 1894 consisted of a fertilizer test, ridge *vs.* level cultivation, pruning the vines, moving the vines, distance experiments, and tests of varieties. The results favored a fertilizer containing potash, cotton-seed meal, and either superphosphate or soft phosphate. Ridge cultivation proved better in 1893 and level cultivation in 1894. Pruning and moving the vines both reduced the yield. A distance of 18 in. between the plants gave the largest yield. The most productive variety was White St. Domingo. Directions for the culture and storage of sweet potatoes are given.

In both years complete fertilizers largely increased the yield. In 1893, 320 to 325 lbs. of kainit and 80 to 81 lbs. of muriate of potash gave practically as good results as larger quantities. In 1893 kainit proved slightly superior to muriate of potash, and cotton-seed meal to nitrate of soda. In 1894 when Florida soft phosphate was compared with acid phosphate the yields were practically identical with the 2 fertilizers. "This can only be accounted for by the assumption that the potato is decidedly indifferent to either."

In 1893 the difference in favor of ridge over level culture was 35.67 bu. per acre. In 1894 the difference in favor of level culture was 33.1 bu., the latter season being dry soon after the plants were set and during September. The variety Pumpkin Yam when undisturbed yielded 201.3 bu.; when pinched weekly to 2 ft. throughout the season, 104.9 bu.; when pinched weekly after September 1 to 2 ft., 50.1 bu.

When the vines were not allowed to root the yield was 156.3 bu. per acre; when undisturbed the yield was 270.3 bu.

In 1893 at distances of 12, 24, and 30 in. between the plants in the row the yields were respectively 267.62, 237.08, and 229.75 bu. per acre. When 2 slips were inserted together at distances of 18 in. the yield was greater than when 1 slip was used either 18 or 9 in. apart. Thirty-three varieties are described and figured and their yields are tabulated. The largest yields were made by White St. Domingo, Shanghai or Clay, Boone White, and Hayman.

"The slit-leaf varieties are much the most productive. . . . They are also generally characterized by bright yellow flesh (when cooked), fineness of fiber, and delicacy of flavor. They are also as a rule excellent keepers. . . . The best potato in point of quality is the Georgia Yam, but it is unproductive. The best combination potato is probably the Tennessee Yam. It is of excellent quality and quite productive."

The composition of sweet potatoes, M. E. JAFFA and M. CURTIS (*California Sta. Rpt. 1893 and 1894, pp. 219–225*).—Seventeen varieties of sweet potatoes grown at the Pomona Substation were analyzed. The average results for the 17 varieties are given in the table below, which for comparison also contains the average results of 21 varieties grown at the Texas Station.

Analysis of sweet potatoes.

	California.	Texas.
	Per cent.	*Per cent.*
Water	70.00	70.00
Ash	1.08	1.14
Protein	1.86	2.41
Fat	.95	.99
Total sugar	5.71	6.81
Nitrogen free extract	23.60	24.00
Fiber	2.51	1.26

Sweet potatoes grown in Texas were richer in protein and sugar, while those grown in California contained a larger percentage of fiber. Of the 17 varieties grown in California, Bermuda contained the highest percentage of protein, 3.08 per cent, and Vineless the second largest percentage, 2.28. Barbadoes gave the largest content of total sugar, 11.55 per cent, and Red Nansemond the minimum. The varieties differed but slightly in the percentage of nitrogen-free extract.

Irish and sweet potatoes are compared with reference to their nutritive value. The potential energy in 1 lb. of Irish potatoes is calculated as 375; in 1 lb. of sweet potatoes, 537.

An analysis is given of the ash of sweet-potato roots, and on the basis of this analysis it is calculated that a crop of 5,000 lbs. of roots removes from the soil 31.4 lbs. of potash, 8.75 lbs. of phosphoric acid, and 15 lbs. of nitrogen.

Fertilizer experiments with sweet potatoes (*New Jersey Stas. Rpt. 1893, pp. 125–136*).—On a fertile soil in Gloucester County, manured the preceding year with 18 tons of barnyard manure, a sweet potato experiment was conducted on twentieth-acre plats in 1893. Mixed minerals (boneblack 120 lbs. and muriate of potash 160 lbs. per acre) were applied alone and in combination with 200 lbs. of nitrate of soda and 280 lbs. of dried blood per acre. Stable manure at the rate of 20 tons per acre was applied alone, and at the rate of 10 tons per acre in connection with half the quantity of commercial fertilizers indicated above. On 2 plats the amounts of commercial fertilizers were increased 50 per cent. The following table gives the yield of sweet potatoes, and the percentage of large potatoes in the crop:

Yield per acre of sweet potatoes differently fertilized.

	Total.	Large.	Small.	Large.
	Bushels.	*Bushels.*	*Bushels.*	*Per cent.*
Unfertilized	181.9	111.9	70.0	61.5
Minerals alone	235.2	170.6	64.6	72.5
Minerals and nitrate of soda	228.0	169.3	58.7	74.3
Minerals and dried blood	203.1	144.2	58.9	71.0
Barnyard manure	225.2	170.9	54.3	75.9

On this rich and well fertilized soil both nitrate of soda and dried blood proved unprofitable, the former, however, giving a yield superior to the latter. Increasing the commercial fertilizers by 50 per cent failed to increase the yield.

Reckoning large potatoes at 70 cts. per bushel and small potatoes at 50 cts., non-nitrogenous minerals alone gave a net profit of $30.68 per acre; non-nitrogenous minerals with nitrate of soda $26.37; non-nitrogenous minerals with dried blood $5.38; stable manure alone a net loss of $6.57; half rations of chemicals and manure a gain of $5.36, and whole rations of manure and chemicals a loss of $20.90.

The results of an experiment at Vineland, New Jersey, are also tabulated, although damage from drought prevented the drawing of conclusions.

Experiments with fertilizers on tomatoes (*New Jersey Stas. Rpt. 1893, pp. 103–119*).—Details and results of an experiment on the value of nitrate of soda in varying amounts, both alone and in different combinations with boneblack and muriate of potash. Twelve twentieth-acre plats were employed, 2 of them being left unfertilized and another treated with barnyard manure, as checks. To some of the plats all of the nitrate of soda was applied at once, and to others 2 applications were made, 3 weeks apart. The tomatoes matured more quickly and gave a greater proportion of early fruit on the plats receiving nitrate of soda. Other results were as follows:

"(1) Nitrate of soda is superior to both barnyard manure and mineral fertilizers alone.

"(2) Nitrate of soda alone is on the whole but slightly less effective than the complete manure.

"(3) When small quantities of nitrate are used the second application is advantageous; and

"(4) Large quantities (320 lbs. per acre) of nitrate are more effective than small quantities (160 lbs. per acre)."

Six tables are given, showing the features of the experiment in detail, the fertilizers applied, the dates of ripening, the relation of the early tomatoes to the entire crop, comparisons of the results from different fertilizers, ratios of the yield and market value, and other points.

Percentages of flesh, juice, and nutrients in the fresh edible portion of some California fruits, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 271–274*).—Brief notes and tabulated data drawn from a number of analyses of different fruits. The fig is placed first in respect to protein, followed closely by the grape, and the nectarine last. The extremes of sugar content are found in fresh prunes and lemons. The results are shown in the accompanying table:

Amount and composition of the edible portion of some California fruits.

Fruits.	Number of analyses.	In whole fruit.		In edible portion.				
					Nutrients.			
		Flesh.	Juice, pressed.	Water.	Protein (N. x 6.25).	Fat, fiber, and carbohydrates, less sugar.	Sugar.	Mineral matters (ash).
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Oranges	13	73.0	52.00	88.30	.760	[1]3.840	7.10	....
Lemons[2]	22	71.0	45.50	....	....	....	1.63	....
French prunes	10	94.2	74.20	75.15	.944	3.641	19.70	.565
All prunes	20	94.2	74.20	80.20	.848	2.368	16.11	.474
Plums	3	95.2	71.00	78.40	.996	6.833	13.25	.524
Apricots	11	93.9	84.50	85.07	1.042	1.477	11.93	.477
Nectarines	1	93.4	85.00	82.90	.625	.855	15.13	.490
Figs	28	100.0	77.65	79.11	1.522	3.261	15.53	.577
Grapes	3	100.0	79.00	80.12	1.256	1.624	16.50	.500

[1] Contains the ash.

[2] The whole fruit yields: Water, 85.04 per cent; organic matter, 14.42 per cent; ash, 0.535 per cent; nitrogen, 0.152 per cent (corresponds to 0.95 per cent protein).

The ash analyses of various fruits reported in several previous bulletins are summarized, and a table is given showing the distribution of the various constituents in different fruits. Figs gave the most ash, 28 samples showing an average of 0.577 per cent, while the orange gave the least, 0.432 per cent. Potash was found to make up from one half to two thirds the whole ash, being the greatest, 63.83 per cent, in the prune, and least in oranges and lemons, 48 per cent. Soda was found to vary from 10.26 per cent in apricots to 1.76 per cent in lemons. The greatest variation was in lime, of which the ash of the lemon contained 29.87 per cent and that of the apricot 3.17 per cent. The percentage of phosphoric acid was found to be quite constant in the majority of the ashes, ranging from 11.9 per cent in lemons to 14 per cent in prunes. Grape ash, however, contained a high proportion of phosphoric acid, 21.24 per cent. The others, minor ingredients, are rated as unimportant and rather uniform. Silica, however, ranges from 0.65 per cent in the ash of citrus fruits to 5.2 per cent in that of apricots and grapes.

Fruit and fruit soils in arid and humid regions, E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 327–334*).—A discussion of the results of analyses of a number of soils from arid and humid regions and of fruits grown on these different soils. Tables are given showing the average of analyses of 466 humid and 313 arid soils, and the albuminoids, sugar, acid, and ash of various California fruits. In all the fruits examined, except the orange, the nutritive value is greater than in the analyses of the like European fruits, the increase in some instances being as much as 50 per cent. More extended and careful study of the subject is urged.

Analyses of bananas and banana soils from the Sandwich Islands, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 275–279*).—Tabulated results of the analyses of 2 samples of soils from Honolulu, made to determine their requirements in the way of fertilizers for bananas. In addition, leaves and fresh fruit of the banana were analyzed to learn the ingredients drawn by them from the soil. It is calculated that an average 80-lb. bunch of bananas extracts 0.55 lb. of muriate of potash. Potash salts or kainit, and Chile saltpeter, dried blood, or some other nitrogenous fertilizer, and lime in the shape of coral sand, are recommended. As chlorin is needed a dressing of salt is also suggested.

Analyses of California oranges and lemons, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 240–256*).—This comprises descriptive notes upon citrus fruits, tabulated proximate analyses of 32 samples of oranges, 18 of lemons, and 1 of pomelo, and is a continuation of the work presented in Bulletin 93 of the station (E. S. R., 3, p. 78). Tables are given showing the results of analyses in detail.

The Navel orange was found to be the largest, but the large proportion of rind, 28 per cent, gave it little if any advantage on account of its size over smaller oranges with thinner rinds. The varieties St. Michael and Tardive possessed only 20 per cent of rind. The Navel was also the driest orange, and the two others mentioned the juiciest, though closely followed by Medium Sweet, Malta Blood, and some seedlings. The King orange, of which but 3 specimens were analyzed, contained the most sugar, 13.17 per cent, being followed closely by seedlings and Navels. The largest amount of acid was found in a sample of Malta Blood, 2.04 per cent, and least in the Mandarin. The Navel also possessed little acid.

The lemons analyzed showed an average of 24.8 per cent rind, which is lower than was found the two years previous. The highest per cent of acid was 8.40 in Royal Messina, in which the juice was 55 per cent of the whole. The highest sugar content was 3.46 per cent, also in Royal Messina.

Analyses of the pomelo gave 2.7 per cent of citric acid and 9.5 per cent of sugar, cane sugar comprising 5 per cent.

The following table shows the average percentages of sugar and acid in various samples of several varieties of oranges analyzed in 1885 and 1891–'93:

Average percentages of sugar and acid.

Variety.	No. of samples.	Sugar.	Acid.
Navels	16	10.46	0.97
Seedlings	12	11.11	1.17
Mediterranean Sweets	8	9.55	1.75
St. Michaels	13	9.65	1.16
Malta Blood	6	10.10	1.41
Ruby Blood	3	11.08	1.51
King	3	13.17	1.49
Tardive (Valentia Late)	2	9.98	1.00

Hastened energy, a new theory, J. H. WATKINS (*Proc. Ga. Hort. Soc. 1893, pp. 62–66*).—This paper deals with experiments conducted to ascertain the effect of planting immature or prematurely ripened fruit seeds. Peaches were chiefly employed in the experiment. It was found that seeds planted from hastily ripened fruit possessed a low degree of vitality and a large percentage would not germinate. Such seedlings as grew produced fruit much earlier than did the parent tree, and in many cases of improved quality.

Field experiments with fertilizers on peach trees (*New Jersey Stas. Rpt. 1893, pp. 138–143*).—Notes on a continued experiment begun in 1884 on a private farm. Potash, either alone or in combination, has given the best results, while nitrate of soda appears to have exerted an unfavorable influence, except when used in connection with superphosphates.

Notes are also given for an experiment just commenced on another farm to test the effect of overfertilizing fruit trees, and the effect of nitrogen and phosphoric acid supplied in different ways, in one case by means of nitrate of soda and boneblack, and in another by ground bone and ground fish. In both cases potash is given as muriate of potash. On each of the fertilized plats the yield in 1893 was more than on an unfertilized plat.

Soil tests with fertilizers used on peach trees, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 13–16*).—Notes and tables showing the results of experiments conducted on 2 private farms to ascertain the value of the several soils and the fertilizers required by each. Both nitrogenous and potash fertilizers gave favorable results, but the best returns were found when the two styles of fertilizers were combined. Crimson clover is regarded as a valuable fertilizer. Mountain Rose, Crawford Early, and Foster were the varieties of peaches used in the test, which has been conducted 3 years and is to be continued.

Orchard fruits, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 364–373*).—Notes on the orchard work conducted at the California Foothill Station at Jackson, Amador County. This comprises comparative and cultural notes on the various varieties of apples, almonds, apricots, plums, prunes, cherries, nectarines, pears, and peaches. Several of the different kinds of fruits are planted on both red soil and granite soil to determine their relative value. Although in other places the granite soil is condemned, here it is found well adapted to many trees, responding rapidly to proper fertilizers. Tabulated data are given showing the dates of blooming and ripening of 62 varieties of peaches and the order of ripening of 17 leading varieties is compared with that of the same varieties in the valley of Alameda County. There is a well-marked difference, showing the preference in different varieties for different altitudes.

Orchard fruits at Paso Robles, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 380–392*).—Comparative and cultural notes on the orchard at the California Southern Coast Range Substation, data being given for 32 varieties of cherries, 13 of almonds, 49 of peaches, 9 of nectarines, 11 of apricots, 21 of plums and prunes, and several of apples, pears, olives, walnuts, chestnuts, quinces, mulberries, and figs. The work in the vineyard is mentioned, and notes given on 3 varieties of gooseberries and on the Logan berry.

Orchard fruits at San Joaquin Valley Station, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 404–410, pl. 1*).—Notes, chiefly cultural, on the orchard at this California substation, especially in regard to the methods of correcting the alkali soil, for which purpose gypsum has been found most valuable. Tabulated data are given for 10 varieties of apples, 18 of apricots, 3 of almonds, 10 of nectarines, 45 of peaches, 13 of pears, and 28 of plums and prunes. An engraving from a photograph is given showing the weakness of pear trees grown on strong alkali soil as compared with those on soil possessing less alkali.

Orchard fruits at the South California Substation, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 416–419*).—Brief notes on the orchard at this substation, which is making a fine growth, although so young that the yield is small. Notes are given on olives, lemons, oranges, almonds, cherries, peaches and nectarines, apricots, plums and prunes, pears, apples, figs, grapes, and walnuts and chestnuts.

The Logan berry, E. J. WICKSON (*California Sta. Rpt. 1893 and 1894, p. 340, pl. 1*).—Illustrated descriptive notes on this peculiar raspblackberry cross, which, in the station grounds, has proved to be a robust grower, with large handsome fruit, possessing a striking flavor suggestive of a combination of that of raspberries and blackberries. The plant appears to be free from all kinds of leaf diseases.

Notes on strawberries for 1894 (*New York State Sta. Bul. 76, pp. 429–444, pl. 1*).—Descriptive and cultural notes and tabulated data for 75 varieties of strawberries fruited on the station grounds for the first time. They were grown in matted rows on stiff clay loam, tile drained, and fertilized with barnyard manure. They were given one cultivation in the spring and mulched 4 or 5 in. deep with straw during the winter.

A table of productiveness showing also the season of ripening is given for 27 varieties, of which Allen No. 5 and Hayne No. 31 lead, with yields of 312 oz. and 283 oz., respectively, from 33 sq. ft. of ground. See No. 2 ranks third, with a yield of 196 oz. Of varieties ripening before June 21 and termed early, See No. 1 was the most productive. Of 10 late varieties, Station No. 198 gave the greatest yield after July 3. One hundred and sixty-four varieties of strawberries were grown at the station during the year, exclusive of several hundred varieties of station seedlings. The work at the station in breeding strawberries for the purpose of originating new varieties is mentioned.

Experiments with fertilizers on strawberries (*New Jersey Stas. Rpt. 1893, pp. 143–145*).—Notes on fertilizing 2 plats of strawberries with nitrate of soda, ground bone, and kainit. In addition 1 plat received nitrate of soda each spring. The latter plat gave an increase in yield of about 20 per cent.

The ash of grapes, F. T. BIOLETTI (*California Sta. Rpt. 1893 and 1894, pp. 322–326*).—Notes and tabulated data on the analyses of the ash of 5 samples of grapes and raisins and 1 of wine, to gain information as to the amount of soil ingredients taken from the ground and the fertilizers needed by the crop. The results are compared with those obtained from analyses in Europe and found to be much the same, the California analyses, however, showing a higher percentage of soda and a lower percentage of lime than was found by the European analyses. This is accounted for by the difference of soil, the California grapes being grown in rich interior valleys where the soil contained much potash and soda. As the phosphoric acid taken from the soil is proportionately large in amount, phosphatic manures are recommended, and the popular belief that the application of such manures to vineyards will communicate bad odors to wine is declared to be erroneous.

The following table shows the results of the analyses compared with those of wheat as regards the fertilizing ingredients taken up:

Ingredients abstracted from the soil.

	Total ash.	Potash.	Phosphoric acid.	Nitrogen.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
5 tons of grapes per acre, average of 5 California analyses	50.00	25.48	10.62	12.60
5 tons of grapes per acre, average of 3 German analyses	50.00	25.07	10.50	17.00
Wheat hay (Johnson), 4,800 lbs per acre	246.00	43.92	19.80	42.00
Wheat (Johnson), 20 bu. per acre	24.00	7.85	11.90	24.00
Wine (Mataro, from Santa Clara County), 800 gal. per acre	15.37	6.67	2.30	.64

Cassava, J. H. HART (*Roy. Bot. Gard. Trinidad, Misc. Bul., 2 (1895), No. 1, pp. 25–27*).—Remarks on analyses of bitter and sweet cassava, showing that the nonpoisonous variety apparently does not exist in Trinidad. It is believed that the amount of prussic acid in sweet cassava is nearly equal to that in the bitter, and that too much confidence has been used in attributing non-poisonous properties to the sweet cassava. Careful boiling of sweet cassava in two or three waters is advised to expel all of the volatile prussic acid.

Castor beans, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 26, 27*).—Brief notes on crops grown in 1892 and 1893. An obscure blight caused the failure of this crop.

Echinocystis lobata, E. ANDRÉ (*Rev. Hort., 67 (1895), No. 1, pp. 9, 10, fig. 1*).—A description of this American curcubit, which is recommended as an ornamental plant chiefly on account of its oval-shaped spiny fruits.

Wild horse-radish, G. ALLUARD (*Rev. Hort., 67 (1895), No. 3, pp. 86, 87, fig. 1*).—Notes on its collection and preparing for market, with directions for cultivation.

The leeks, G. ALLUARD (*Rev. Hort., 67 (1895), No. 1, pp. 20–22, fig. 3*).—Descriptive and cultural notes on several varieties of leeks, giving directions for their best cultivation.

Onions from seed, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 93–95*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 419).

Salsify, C. L. NEWMAN (*Arkansas Sta. Rpt. 1894, pp. 95, 96*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 423).

Culture and cooking of Sechium edule (*Agl. Jour. Cape Colony, 7 (1894), No. 26, p. 614*).

Varieties of sweet potatoes, C. H. SHINN (*California Sta. Rpt. 1893 and 1894, pp. 420–424*).—Twenty-one varieties of potatoes tested at the Southern California Substation are described, and for a few of these the results of cooking tests are noted.

Best forms of food for the sweet potato crop, A. W. PEARSON (*Amer. Agr. (middle ed.), 1895, Mar. 23, p. 314*).—Advises use of chemical manures applied some months before planting.

The cultivation of tomatoes on a large scale in the vicinity of Paris, G. ALLUARD (*Rev. Hort., 67 (1895), No. 2, pp. 45–47, fig. 1*).—A general article on the subject dealing with the cultural method and describing some of the varieties most in use.

A new method of etiolation, E. A. CARRIÈRE (*Rev. Hort., 67 (1895), No. 1, pp. 12, 13, figs. 2*).—Description of a method of blanching chicory and other salad plants by placing a cask over the growing plant with its sides perforated with holes to allow free circulation of air. The method is claimed to be very successful.

Truck farming on the coast lands, G. M. RYALS (*Proc. Ga. Hort. Soc. 1892, pp. 26–29*).—Notes on market gardening in the coast region of Georgia, with remarks on the preparation and fertilizing of the land, the character of seed to be used, and shipping and marketing. Celery is regarded as an especially valuable crop.

Some apples adapted to all sections of Arkansas, J. T. STINSON (*Arkansas Sta. Rpt. 1894, pp. 44–47*).—A reprint from Bulletin 26 of the station (E. S. R., 5, p. 1075).

Arkansas seedling apples and nursery stock, J. T. STINSON (*Arkansas Sta. Rpt. 1894, pp. 48–50*).—A reprint from Bulletin 26 of the station (E. S. R., 5, p. 1075).

Analyses of figs, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 225–235*).—A reprint from Bulletin 102 of the station (E. S. R., 5, p. 301).

Figs at the Foothill Station, G. HANSEN (*California Sta. Rpt. 1893 and 1894, pp. 375–378*).—Comparative notes on some of the varieties of figs grown at this California substation. Fifty-two varieties are planted. The variety Hirtu du Japon is considered the best bearer. Of the white varieties White Adriatic, DuRoi, and White Marseilles; of brown, Drap d'Or and Brown Turkey; and of black, Pasteliere and Rond Noir were most satisfactory.

Figs at Tulare Station, J. FORRER (*California Sta. Rpt. 1893 and 1894, pp. 411–414*).—Descriptive and comparative notes on 39 varieties of figs grown at this substation.

The mango, J. H. HART (*Roy. Bot. Gard. Trinidad, Misc. Bul., 2 (1895), No. 1, pp. 11–13*).—Cultural notes on *Mangifera indica*, especially in reference to the soil and grafting. It is stated that if well cultivated, mangoes will produce sweet, pleasantly flavored fruit that deserves a wide reputation. The varieties cultivated at the botanic gardens are named.

The mangosteen, J. H. HART (*Roy. Bot. Gard. Trinidad, Misc. Bul., 2 (1395,) No. 1, pp. 10, 11*).—Notes on the tree and fruit of *Garcinia mangosteena*, which has been introduced from the East Indies into Trinidad, where it is growing well, and the fruit being liked. The mangosteen possesses a thick, brittle, bitter rind, which readily cracks off, exposing the white pulp divided into quarters. Only 1 or 2 mature seeds are produced by each fruit.

Olive culture, A. P. HAYNE (*California Sta. Rpt. 1893 and 1894, pp. 298–322*).—Cultural notes for the olive, comprising remarks on pruning, curing, harvesting, and storing of the fruit and the expression of the oil. The greater part of the paper is a reprint from Bulletin 104 of the station (E. S. R., 6, p. 141).

Twig budding and grafting the olive, E. J. WICKSON (*California Sta. Rpt. 1893 and 1894, pp. 339, 340*).—A brief note on the subject, including a letter from an experienced orchardist, detailing methods employed by him in budding and grafting, which have proved most successful.

Olives and olive oil, A. P. HAYNE (*California Sta. Rpt. 1893 and 1894, pp. 279–297, pl. 1*).—Descriptive notes on the trees and fruit of 20 varieties of olives, with analyses showing the number of olives in 100 gm. and the percentage of pit, flesh, and oil in the fruit. Fifty-six varieties of olives are now planted at the various substations.

The peach palm, J. H. HART (*Roy. Bot. Gard. Trinidad, Misc. Bul., 2 (1895), No. 1, pp. 28, 29*).—Descriptive notes on *Guilielma speciosa*, which is found growing well in Trinidad. The palm usually bears two crops in a year, that in October being composed of large fruit with abortive seeds, while the other consists of small fruits with hard fertile seeds. The October fruit is boiled and eaten with salt, and is considered a very nutritious human food.

Japanese plums, L. H. BAILEY (*Rev. Hort., 67 (1895), No. 2, pp. 51, 52*).—Translated from *Gardener's Chronicle*, giving brief descriptive and comparative notes on the chief varieties of Japanese plums that have been introduced and grown in America.

Examination of California prunes, apricots, plums, and nectarines, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 257–268*).—A reprint of Bulletin 101 of the station (E. S. R., 4, p. 918).

Analyses of prunes and apricots, G. E. COLBY (*California Sta. Rpt. 1893 and 1894, pp. 268–271*).—Descriptive notes on 6 varieties of prunes and 1 of apricot, with a table giving in detail the results of the proximate analyses. The sugar content in all the instances was below that determined by previous analyses. French prunes possessed the most sugar, 13.95 per cent.

Catalogue of the fruit trees at the California Experiment Stations (*California Sta. Rpt. 1893 and 1894, pp. 474–490*).—This comprises long lists of the varieties planted at the central station and at 4 substations, there being given 274 varieties of apples, 18 of crab apples, 23 of almonds, 48 of apricots, 40 of cherries, 5 of chestnuts, 2 of citron, 68 of figs, 6 of lemons, 10 of mulberries, 17 of nectarines, 20 of oranges, 169 of peaches, 166 of pears, 120 of plums and prunes, 7 of persimmons, 8 of quinces, and 19 of walnuts.

Fruit culture in north Georgia, J. C. MILLER (*Proc. Ga. Hort. Soc. 1892, pp. 68–70*).—General remarks on fruit growing in northern Georgia, the author believing that fruits can be produced here equal to those grown in California.

Catalogue of Georgia fruits (*Proc. Ga. Hort. Soc. 1892, pp. 71-86; 1893, pp. 69-85*).—An annotated list and tabulated data for various kinds of fruit successfully cultivated in Georgia, the State being divided into 4 sections, the upper or mountain, the middle, the southern, and lower or coast region.

Fruits of Bohemia, F. THOMAYER (*Rev. Hort., 67 (1895), No. 1, pp. 17, 18*).—Historical notes on several varieties of apples, peaches, and other fruits which have been originated in Bohemia, which has for centuries been noted for its orchards and its production of valuable varieties of fruits.

Fruit culture in Gironde, C. GÉRAND (*Rev. Hort., 67 (1895), No. 4, pp. 74-76*).—Short articles giving the status of fruit growing in this Department, with lists of the preferred varieties.

Various methods of soil improvements in orchards, N. Schneider (*Rev. Hort., 67 (1895), No. 1, pp. 22-25; No. 2, pp. 48-50*).—General remarks on the subject dealing with manuring and tilling the ground.

An implement for vine grafting, E. André (*Rev. Hort., 67 (1895), No. 4, pp. 67, 68, fig. 1*).—Illustrated description of an apparatus for cutting the stems of grape vines in making various kinds of grafts.

Notes on pruning deciduous fruits, W. H. Tyson (*California Sta. Rpt. 1893 and 1894, pp. 397-400*).—General remarks on the subject and special directions as to the proper pruning to be given almonds, apricots, prunes, apples, pears, cherries, and peaches. Severe pruning is advised for most cases, low, round heads to be established.

The effect of pruning and training on the natural habits of the grape, S. D. Riegel (*Proc. Ga. Hort. Soc. 1892, pp. 32–34*).—General notes on the subject, with a discussion of the respective value of various systems. Fuller's oblique training is recommended for trellises, and the serpentine system for stakes. Intelligent pruning is urged.

Earliness vs. quality in fruits, S. Hape (*Proc. Ga. Hort. Soc. 1892, pp. 67, 68*).—A short popular paper urging that early fruits are apt to be immature and possess little or insipid flavor.

Transportation of fruits and vegetables, W. L. Glessner (*Proc. Ga. Hort. Soc. 1893, pp. 26–28*).—A general discussion of the problem of the transportation of horticultural products, picking, packing, and shipping being in turn considered. Care in icing the refrigerator cars is urged.

Canning vegetables and fruits (*Amer. Agr. (middle ed.), 1895, Mar. 5, p. 252*).—Tabulated data give the results obtained at a California cannery regarding the number of pounds of each fruit and vegetable required to make 100 lbs. of canned goods, amount of sugar required, and cost of labor in canning.

Canning, drying, and preserving fruit, A. H. Benson (*Agl. Gaz. N. S. W., 5 (1894), No. 12, pp. 857–866*).

A new process of preparing raisins, A. Petit (*Rev. Hort., 67 (1895), No. 1, pp. 69, 70*).—A brief description of a scheme of curing raisins by exposing them to an atmosphere of alcohol vapor at 60° F. for 2 months.

Report of horticulturist (*Mississippi Sta. Rpt. 1893, pp. 33–37*).—A report on the horticultural work of the station, strawberries and grapes having received most attention, and being treated of at greatest length. Cultural notes are given for these fruits. The horizontal trellis is preferred for training grapevines. Cottonseed hulls are recommended as mulch and fertilizer for strawberries, and ashes for fertilizing grapes. Lists of the preferred varieties of strawberries and grapes are given.

FORESTRY.

The chestnut in the West, C. A. Keffer (*Garden and Forest, 8 (1895), p. 83*).

The honey locust in the West, C. A. Keffer (*Garden and Forest, 8 (1895), p. 112*).—The tree has flourished very well on the dry uplands of western Kansas, although a failure at the South Dakota Station.

Notes on the distribution of the yellow pine in Nebraska, C. E. Bessey (*Garden and Forest, 8 (1895), pp. 102, 103*).

Species of cork-forming trees, H. Mayr (*Centbl. Ges. Forstw. Wien, 21 (1895), No. 2, pp. 55-57*).—The author enumerates *Ulmus suberosa*, *Acer campestre*, *Euonymus europæus*, *Fraxinus anomala*, *Xanthoxylum clava-hercules*, *Quercus suber*, *Q. occidentalis*, etc.

The lesson of the forest fires, B. Hubbard (*Pop. Sci. Monthly, 1895, Mar., pp. 586–596*).

The forestry stations, C. H. Shinn (*California Sta. Rpt. 1893 and 1894, pp. 425–432*).—A brief history of the establishment and a report on the present condition of the forestry stations at Chico and Santa Monica are given.

SEEDS—WEEDS.

Distribution of seeds, plants, cuttings, etc., E. J. WICKSON (*California Sta. Rpt. 1893 and 1894, pp. 343–362, fig. 1*).—A report is given of the distribution by the station of seeds, plants, cuttings, etc., since 1890, the details of the offerings having appeared in Bulletins 95, 98, and 103 of the station (E. S. R., 3, p. 444; 4, p. 557; 5, p. 683). Statistics are given of the distributions since 1886, showing that there were sent out 52,310 plants and cuttings and 40,457 ounces of seed. Brief reports are given by the voluntary experimenters on the materials sent out. A list of donations to the station since December, 1892, is appended.

Some Oregon weeds, M. CRAIG (*Oregon Sta. Bul. 32, pp. 99–116, figs. 9*).—The author gives illustrated descriptive notes on 5 troublesome weeds, as follows: Canada thistle (*Cnicus arvensis*), bull thistle (*C. lanceolatus*), sow thistle (*Sonchus arvensis*), spiny or dagger cockle bur (*Xanthium spinosum*), and Russian thistle (*Salsola kali tragus*). The State laws relating to the destruction of Canada thistle and dagger cockle bur are given, and in addition to the ones enumerated above the author suggests that the laws be modified to include French pink (*Centaurea cyanus*), dog fennel (*Anthemis cotula*), tarweed (*Madia* spp.), white mustard (*Brassica campestris*), oxeye daisy (*Chrysanthemum leucanthemum*), and moth mullein (*Verbascum blattaria*).

Directions are given for the destruction of weeds in general, with specific directions for the 5 species particularly mentioned in the bulletin.

Germination of black walnuts and acorns, G. B. SUDWORTH (*Garden and Forest, 8 (1895), pp. 105, 106*).—The author accounts for the prolonged vitality of seeds deeply planted as due to the probably accidental but proper adjustment of moisture conditions.

The vitality of seed, A. PETER (*Nachrichten Kl. Ges. wissensch. Göttingen; abs. in Nature, 51 (1895), Feb. 28, p. 422*).—The author gives the results of a second series of cultural experiments with dormant seeds taken from various depths in the soil of woodlands or forest. "The forest in question was the site of villages and cultivation that disappeared several centuries ago; and some of the samples were taken from a dense forest, 100 to 150 years old, under the shade of which there has been no surface vegetation for years. The principal point to investigate was the probable existence of seeds of cornfield weeds still possessing the power of germinating and developing into reproductive plants. The author succeeded in raising a large number of plants belonging to about 50 species, including some of the weeds of cultivation; and he believes he has good grounds for supposing that many pasture plants and cornfield weeds retain their vitality for more than a half century, under the conditions he describes."

On the seeds of Moabi, H. LECOMTE and A. HÉBERT (*Compt. Rend., 120 (1895), No. 7, pp. 374–377*).

On the seeds of the Coula of the French Congo, H. LECOMTE and A. HÉBERT (*Compt. Rend., 120 (1895), No. 4, pp. 200–202*).

Methods of planting and destroying Bermuda grass, C. L. NEWMAN (*Arkansas Sta. Rept. 1894, pp. 103–108*).—A reprint from Bulletin 28 of the station (E. S. R., 6, p. 439).

A method of destroying dodder, A. SERVAIS (*Ingén. Agr. Gembloux, 5 (1895), No. 8, pp. 354, 355*).—The plants on the spots where dodder is present are carefully removed and burned, the spot is worked with a hoe or rake, and orchard grass or some other quick-growing species is planted on the infested spot. The author states that dodder thus treated may be entirely eradicated within 2 years.

Troublesome grasses of southern New Jersey, M. TREAT (*Garden and Forest, 8 (1895), pp. 103, 104*).—Notes are given on *Elusine indica, E. ægyptiaca,* Bermuda grass, and coco or nut grass.

DISEASES OF PLANTS.

Fungus diseases of plants, B. D. HALSTED (*New Jersey Stas. Rpt. 1893, pp. 326–436, figs. 63*).

Synopsis.—Notes are given on fungi on weeds, strawberry diseases, club root of cabbage and its allies, soil rot of sweet potatoes, on the identity of the anthracnose of watermelon and bean, fungus diseases of the muskmelon, some fungus diseases of the pea, a fatal disease to truck crops, field observations upon fruit decays, decays of mature apples, blight of ornamental spurge, fungus diseases of cultivated sedums, hollyhock fungus diseases, some carnation fungus diseases, mint rust on balm, fungus diseases of ornamental bulbous plants, anthracnose of rose, ivy blight, palm diseases, blights of dracæna, orchid diseases, blight of ornamental ferns, bacteria in some of their relations to crop growing, leaf blight of calceolaria, dropsical pelargoniums, and notes on a new *Exobasidium.*

Fungi on weeds (pp. 326, 327).—Notes are given on several fungi that serve to keep some of our worst weeds in check. The species of fungi mentioned are *Cystopus candidus* on the shepherd's purse and some other cruciferous plants, *C. portulacæ* on the common purslane, and *Puccinia suaveolens* on the Canada thistle. A report is given of the last-named fungus having nearly exterminated an acre of the thistle, scarcely a plant maturing any seed.

Diseases of the strawberry (pp. 327–332).—The more important fungus diseases of the strawberry as enumerated are: Leaf spot (*Sphærella fragariæ*), leaf blight (*Phyllosticta fragaricola*), leaf spot (*Septoria aciculosa*), leaf spot (*Ascochyta fragariæ*), anthracnose (*Glæosporium fragariæ*), leaf blight (*Ramularia modesta*), and mildew (*Peronospora fragariæ*). Of these the leaf spot (*Sphærella fragariæ*) is perhaps the most destructive. The author reviews the more important contributions on this disease since 1887, when there was given a comprehensive bibliography.[1] Another of the leaf spots (*Ascochyta fragariæ*) may easily be mistaken for this disease. A new strawberry leaf blight has been under investigation by the author since 1892. It was first discovered near Syracuse, New York, and it seems to be far from rare, though often obscured by the presence of other fungi. The disease is caused by a fungus apparently of the genus *Aposphæria.* This fungus appears to prefer the upper surface of the leaf, but develops its pycnidia on both sides of the leaf. The affected portions lose their characteristic green and soon become brown. The pycnidia first appear as minute elevations of the same color as the leaf, but as the spores mature they become amber colored and rise prominently from the leaf. Inoculations under a bell jar gave within 10 days well-developed pycnidia on healthy leaves. As a rule it is only the old leaves that are affected and these should be burned. Bordeaux mixture may prove effective against this blight.

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[1] U. S. Dept. Agr. Rpt. 1887, p. 340.

Club root of cabbage and its allies (pp. 332–345).—This is a reprint of Bulletin 98 of the station (E. S. R., 5, p. 685).

Soil rot of sweet potatoes (pp. 345, 346).—A report is given of some field experiments conducted with the view of checking the soil rot of sweet potatoes. Series of rows of plants growing in infested soil were treated as follows:

"(1) On May 13, 2 rows while still open and before manuring, were sprayed thoroughly with the Bordeaux mixture.

"(2) On May 13, 2 rows sprayed as in 1 after the manure had been placed.

"(3) Two rows left untreated.

"(4) On May 13, 2 rows sprayed after they were made up and before setting the plants.

"(5) On May 20, 2 rows with the plants sprayed directly after setting.

"(6) On August 10, 2 rows sprayed after the plants had run vines 18 to 20 in. long."

The results obtained showed "that spraying the rows before the addition of manure is the better way of treating the ground for the prevention of the soil rot of the sweet potato." There appears, from the tabulated results given, a gradual increase in the amount of soil rot present from the first series to the last.

Identity of the anthracnose of the bean and watermelon (pp. 347–352).—The author reports having inoculated citrons on opposite sides of a line with spores from the bean and watermelon. Both inoculations grew rapidly and nô differences could be detected, proving the identity of the two diseases. The author reviews the synonymy of the fungus and concludes the name should be *Colletotrichum lagenarium*.

Fungus diseases of the muskmelon (pp. 352–356).—Mention is made of three of the more important diseases of the muskmelon. The first is a downy mildew (*Plasmopara cubensis*), similar to the downy mildew of the grape and amenable to the same treatment. The second is of a bacterial nature. Parts of the plant, as the stem, petioles, or leaf blades, when attacked have a peculiar watery appearance. The author thinks it probable that the germs of this disease may be carried over from year to year in the soil, and probably several crops may be affected by the same disease. Spraying is thought to check the disease. The third trouble is a leaf spot due to a species of *Phyllosticta*. It is confined to the leaves and younger parts of the vine, and it seems very probable that it could be controlled by spraying with any of the more common fungicides.

Some fungus diseases of the pea (pp. 357–362).—Several fungus enemies of the pea are described, the more important being pea mildew (*Erysiphe martii*), pea rust (*Uromyces appendiculatus*), pea blights (*Ascochyta pisi* and *Septoria pisi*), black mold of pea (*Pleospora pisi*), damping off (probably *Pythium debaryanum*), a bacterial disease, and a disease attacking the seed, producing dark olive patches on the seed coat a few days after planting. These diseases may occur singly or more commonly associated with some of the others. The nature of their attack on the host is described, and the use of fungicides and selection of sound seed recommended as preventive treatment.

A fatal disease to truck crops (pp. 362–366).—Specimens of diseased tomato, eggplant, and other plants were sent the author from the Florida Experiment Station, and the disease was recognized as similar to one on lupines in Louisiana, in which a *Penicillium* developed abundantly when placed in a moist chamber. Cultures made from the Florida material developed sclerotia abundantly in a short time. Cultures were made on the stems of corn, squash, cucumber, and several weeds, upon all of which the fungus grew vigorously. Open-air cultures were not so successful, and on some plants the fungus was made to grow only by exercising great care, and it is thought that while the disease may be very destructive in Florida it will not prove serious in the latitude of New Jersey. The study of this disease is still in progress.

A field observation upon fruit decays (pp. 366, 367).—In Bulletin 91 of the station (E. S. R., 4, p. 657) the author reported on a decay of quinces due to *Sphæropsis malorum* and claimed that the source of contamination was an apple tree near by. A visit was made in July, 1893, to the orchard, and while there was no decay manifest on the quinces and pears, a grafted branch of the suspected apple tree was loaded with fruit, a large per cent of which was decayed. The fruit on the remaining branches of the tree was unaffected. The obvious remedy in this case was removing the graft of the early variety of fruit (Red Astrachan).

Decays of mature apples (pp. 367–377).—This is a reprint of a popular article[1] in which are described specking of apples, apple scab, mold, blotch, bitter rot, and black rot.

Blight of ornamental spurge (pp. 377–379).—An anthracnose of euphorbias, due to *Glœosporium euphorbiæ*, is described.

Fungus diseases of cultivated sedums (pp. 379–381).—Two diseases of sedums are described, an anthracnose due to *Septoria sedii*, and a disease due to *Vermicularia telephii*. The affected portions should be collected and burned to prevent the spreading of the diseases.

Hollyhock diseases (pp. 381–383).—Descriptions are given of a hollyhock rust (*Puccinia malvacearum*), a leaf spot (*Cercospora althæina*), and a leaf blight (*Phyllosticta althæina*). All sorts of hollyhocks are subject to these diseases. The author recommends that seed should be saved only from plants free from disease, that all young plants known to be affected should be rejected, and that old plants be sprayed with Bordeaux mixture at least once a week during the growing season.

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[1] Pop. Sci. Monthly, 1893, May.

Some fungus diseases of carnations (pp. 384–391).—A popular paper read before the American Carnation Society, January, 1893, describing carnation leaf spot (*Septoria dianthi*), anthracnose (*Volutella* sp.), leaf mold (*Heterosporium echinulatum*), and a bacterial disease. Remedies are suggested for carnation diseases, the most successful ones being sprays of potassium sulphid solution, Bordeaux mixture, and ammoniacal copper carbonate.

Mint rust on cultivated balm (pp. 391, 392).—The mint rust (*Puccinia menthæ*) is reported on the cultivated balm (*Melissa officinalis*). The form of rust present is the one having echinulate teleutospores and is known as form *americana*.

Fungus diseases of ornamental bulbous plants (pp. 392–396).—Diseases of lilies, hyacinths, tulips, narcissus, gladiolus, and crocus are described. The rejection of all diseased bulbs is advised as a precautionary measure.

Diseases of cyclamens (pp. 396–399).—Diseases due to *Phoma cyclamenæ*, *Botrytis vulgaris*, *Colletotrichum cyclamenæ*, and a bacterial disease are described.

Diseases of callas (pp. 399–401).—A bacterial disease, one due to *Phyllosticta richardiæ*, a disease due to *Cercospora richardiæcola*, and another due to *Pestalozzia richardiæ* are mentioned.

Rose anthracnose (pp. 401–405).—In the Annual Report of the station for 1892, p. 280 (E. S. R., 5, p. 399), mention was made of several destructive diseases of roses, among them an anthracnose due to *Glœosporium rosæ*, which causes the defoliation of the canes. Further investigations of this disease show that the whole plant is infested by the fungus, which saps its vitality to such a degree that those leaves showing no trace of disease are unable to perform their usual functions. The appearance and habit of growth of this fungus are similar to the raspberry anthracnose (*G. venetum*), and the author suggests their probable identity. Young plants or young shoots are most susceptible to the disease. Roses that have a sickly colored foliage, with the leaves falling prematurely, especially from the tips of the canes, may be suspected of being attacked by the anthracnose, and the pink blotches may be seen by the aid of a hand lens on the leaves and stems. All affected canes should be cut, and, together with the fallen leaves, gathered and burned. Sound plants may be protected by frequently spraying them with Bordeaux mixture or ammoniacal copper carbonate.

A blight of variegated ivy (pp. 405–407).—A blight of the variegated forms of the English ivy is reported due to *Vermicularia trichella*. All variegated plants are especially susceptible to fungus diseases, as the etiolated portions are less able to resist the entrance of the spores. All diseased leaves of such plants should be removed and the remaining ones protected by sprays of copper compounds.

Palm diseases (pp. 407–411).—Several diseases of palms, especially Kentias, are figured and described. All diseased leaves or parts of leaves, which may be recognized by the dead or discolored spots, should be removed and the remaining foliage sprayed at least once a week with Bordeaux mixture. A leaf blight of caryotas is also described and the same treatment recommended.

Blights of dracænas (pp. 412–414).—A blight, due to *Phyllosticta maculicola*, causing small brown angular spots in the leaves, surrounded by yellowish areas, is described. Another blight more destructive to the thick leaved dracænas is caused by *Vermicularia concentrica.* A third disease, a leaf tip blight of *Dracæna fragrans*, caused by *Glæosporium* sp., is illustrated and described. The author thinks these diseases could be prevented to a great degree by the use of any of the standard fungicides.

Orchid diseases (pp. 414–419).—Leaf diseases of *Sorbralia macrantha* and *Bletia volutella*, and petal blights are described. Care in not propagating from diseased plants and use of fungicides are advised as preventive treatment.

Tip blight of ornamental ferns (pp. 419–421).—Fern blights are described and Bordeaux mixture as a preventive treatment advised.

Bacteria in some of their relations to crop growing (pp. 422–430).—A reprint is given of a semipopular paper on bacteria read before the New Jersey Horticultural Society.

Bacterial leaf blight of calceolarias (pp. 430, 431).—A disease, due to *Micrococcus* sp., is described as causing brownish patches on the lower leaves.

Dropsical pelargoniums (pp. 432, 433).—Numerous instances are reported of pelargoniums being spotted, but no fungus could be found. The author thinks it probable that the plants were affected by the same cause, resulting in what has been called œdema of tomato.[1] The remedy recommended is a cooler, dry soil, with increased light wherever possible.

Notes on a new Exobasidium (pp. 434–436).—Notes are given on *Exobasidium peckii*, a fungus almost entirely confined to the inflorescence of *Andromeda mariana*, its attack resulting in abnormally developed flowers.

Report of the mycologist, F. D. CHESTER (*Delaware Sta. Rpt. 1893, pp. 103–131, figs. 2*).

Synopsis.—A report is given on the treatment of peach rot and blight; observations on root rot of crimson clover, diseased cowpeas, and anthracnose of tomato; and a report of bacteriological work in various lines, principally in the preparation of attenuated anthrax virus.

Treatment of plant diseases (pp. 103–109).—Experiments were conducted in 2 orchards for the prevention of peach rot and blight. The treatment consisted in (1) winter treatment, the removal of all mummy fruits and washing the trees with a copper sulphate solution; (2) spraying twice before the buds opened; (3) spraying with Paris green for curculio; and (4) spraying when the fruit began to show color to prevent attacks of the rot. In the first orchard the fungicides used as sprays were ammoniacal copper carbonate and suspended copper carbonate with glue. As a result of the winter treatment it was found that 26 per cent blighted blossoms were on the unsprayed trees, as compared with 12 per cent on those given treatment and 17 per cent on those given the early spraying but no winter treatment. Owing to the fruit not having been gathered according to directions, the results of the other treatments were lost.

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[1] New York Cornell Sta. Bul. 53 (E. S. R., 5, p. 55).

In the second orchard the same treatments were tested with 3 additional fungicides, viz, copper and ammonium carbonate, copper acetate, and copper sulphate and calcium chlorid solutions. The results obtained indicate encouraging benefits from spraying, and the question of whether winter treatment and early spraying is not sufficient is to be the subject of further experiment. The use of Paris green was attended with a greater total yield over their checks, amounting to about 3 times the yield where no treatment was given. There was a decreased amount of rot present in those trees having been treated for that disease.

Observations on plant diseases (pp. 109–115).—The author made cultures of the crimson clover root rot, *Sclerotinia trifoliorum*, previously published as *S. trifolium*,[1] and found it would grow readily on indifferent media. This shows its power to live as a saprophyte as well as parasitically on its host. Any cultivation that tends to stir the soil will tend to eradicate the fungus.

A lot of cowpea seed was sown, and the developing plants were so badly diseased as to require a replanting. The second lot of seed was examined and 9.5 per cent found to be affected by *Colletotrichum lindemuthianum*. The presence of the disease can be recognized by the spotted appearance of the seed, and all such should be rejected.

Notes are given on the ripe rot or anthracnose of tomato. In the Annual Report of the station for 1891, p. 60 (E. S. R., 5, p. 59), this disease was described as due to *C. lycopersici*, n. sp., but the author has since decided it as identical with *C. phomoides*, the name by which the fungus should be known. The author made numerous inoculations with the spores, and found that they would as readily grow on the pepper, grape, and apple as on the tomato, a fact which he thinks points toward the probable identity of the ripe rots of these fruits.

Bacteriological work (pp. 115-131).—The author gives in detail the methods followed in preparing an attenuated anthrax virus for use in the protection of cows against anthrax. The method employed was that of attenuation by heat, keeping the cultures at a temperature of 42 to 43° C. for a time, the different lots being tested until the required attenuation is secured. Examinations were made by the author of milk and a supposed case of anthrax in man without finding the specific bacilli present, while they were found in a case of anthrax in a horse.

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[1] Delaware Sta. Rpt. 1890, p. 84 (E. S. R., 3, p. 689).

A microscopical examination of 4 lots of wheat bran was made to ascertain the presence of cockle-seed meal. In none of the samples was there any important admixture. The presence of cockle may be readily recognized when at all abundant by the characteristic saponin bodies.

The author made a study of some of the mold fungi to test the common belief that cerebro-spinal meningitis is due in some way to these fungi. Jars of bread paste were exposed in a stable where several horses had died with the above disease. The species of molds collected were: *Aspergillus nigricans*, *A. fumigatus*, *Rhizopus nigricans*, and *Penicillium glaucum*. The only fungus of interest was the *Aspergillus fumigatus*, and from this cultures were made on oats. Nothing positive is shown as to the ability of these molds to produce the disease in question. However, a rabbit inoculated with 0.5 cc. water containing spores of *A. fumigatus* died in 5 days. Cultures made from the viscera of the rabbit did not develop any of the mold in either agar tubes, Petrie plates, or bread-paste jars.

The southern tomato blight (*Mississippi Sta. Rpt. 1893, pp. 53–61, fig. 1*).—A report is given of 3 years' experiments, conducted by F. S. Earle at the Ocean Springs substation, for the prevention of the tomato blight, reported in Bulletin 19 of the station (E. S. R., 3, p. 702). The experiments consisted in soil treatments in the field and bed and spraying the plants with well-known fungicides. Based on 1 year's experience, the author thinks that whether the blights of tomatoes, potatoes, and watermelons are identical or not they are not easily communicated from one crop to another under the ordinary field conditions.

The author presents the following tentative conclusions:

"(1) In preparing compost for the seed bed and cold frame, use a liberal amount of lime, kainit, ashes, or other potash salt. This will give good, stiff-stemmed, stocky plants, which are better able to resist blight.

"(2) A few days before sowing the seed sprinkle the bed thoroughly with strong Bordeaux mixture and rake it in.

"(3) After the plants are set in the field add Paris green to the Bordeaux mixture and continue to spray at intervals of 10 days or 2 weeks until the fruit is half grown. Care must be exercised in spraying after the fruit is set, as it is more easily injured than is the foliage.

"(4) Never plant tomatoes on land where they grew the previous year, and at least 2 years' rest is much safer.

"(5) While this station does not recommend the practice of following either melons or potatoes with tomatoes, it records the fact that it can often be done with safety."

A new disease of the olive tree, A. P. HAYNE (*California Sta. Rpt. 1893 and 1894, pp. 297, 298*).—The author reports the presence in various parts of the State of a new leaf disease of olives, which he has determined as probably due to *Cycloconium oleaginum*, a fungus which is rather common in southern Europe. He quotes G. Boyer, of the École Nationale d'Agriculture, Montpellier, France, who has made an exhaustive study of the disease. Both surfaces of the leaf are attacked, but more commonly the upper, where it forms circular spots, black, gray, or brownish in color, the center usually being of a different color from the surrounding portions of the spots. The spots vary from 6 to 15 mm. or more in diameter and are irregularly distributed over the leaf, and may sometimes be found on the peduncle and fruit. The fungus may appear any time of the year, but its most serious attack is usually late in the summer or autumn. The black color is due to the presence of the abundant dark-colored spores, and as these become scattered the color becomes lighter.

In California the only variety on which the disease has been observed is the Mission. Its attack is so insignificant that at least for the present no treatment is required.

Experiments in winter spraying of apples and pears, C. W. WOODWORTH (*California Sta. Rpt. 1893 and 1894, pp. 441–462*).—Notes and extensive tables on experiments in spraying apple and pear trees for two seasons against the oyster-shell scale, greedy scale, and woolly aphis, conducted in the station orchard at Berkeley. A plat is given showing the arrangement of the trees treated. Various insecticides and fungicides were used, both alone and in combination. The results, as indicated by the elaborate detail of the several tables, seem to show but little value from the treatment. Formulas are given for the preparation of various insecticides and fungicides and the indications for their use are mentioned.

Peach yellows experiments, M. H. BECKWITH (*Delaware Sta. Rpt. 1893, pp. 152, 153*).—The author reports experiments with seedling peach trees and with trees brought from a region where the yellows is not known, in which it is shown that such trees are no more capable of resisting the disease than others.

A disease of mulberries, A. PRUNET (*Compt. Rend., 120 (1895), No. 4, pp. 222–225*).—The author claims that there is great confusion in the diseases of the mulberry, due to their varying manifestations. He thinks there is a disease of the mulberry similar to that of the grape, which he has called chytridiose, and that it is due to a species of *Cladochytrium*, to which he has given the name *C. mori*. It differs from *C. viticolum*[1] in its smaller zoösporangia, cystes, and zoöspores. Its attack on the mulberry is very similar to that of the related species on the grape. The treatment recommended is the same in each case, applications of solutions of iron sulphate.

The black rot and its practical treatment, G. LAVERGNE and E. MARRE (*Le Black rot et son traitement pratique. Bordeaux: Féré, 1895*).—The authors have prepared a condensed manual based on their observations made in 1894 during an official examination of the black rot and its practical treatment.

Their conclusions are as follows:

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[1] Compt. Rend., 119 (1894), No. 19, pp. 808–811 (E. S. R., 6, p. 642).

"(1) After the grapes are gathered, collect all dried grapes and those which have fallen from the bunches, together with all the leaves that are strewn on the ground, and burn them.

"(2) Prune as closely as possible, eliminating all the young sprouts. Collect and burn the cuttings.

"(3) During the latter part of March wash the vines with an acid solution of copper sulphate to which there may be added iron sulphate if anthracnose be suspected, the formula recommended being copper sulphate 10 kg., iron sulphate 10 kg., sulphuric acid 1 kg., hot water 100 liters.

"(4) Upon the return of spring and when the young shoots are 6 to 10 cm. in length apply Bordeaux mixture, using 3 kg. copper sulphate to 3 kg. of lime. Apply whenever the atmospheric conditions will allow and repeat if washed off by rain.

"(5) Ten or 15 days later, depending on the size of the sprouts, give a second spraying.

"(6) Give a third, fourth, and if necessary a fifth spraying at intervals of 15 to 30 days, dependent on the atmospheric conditions.

"(7) Before the time for the appearance of oïdium, dust the vines with sulphur and dry copper sulphate or with copper sulphosteatite.

"(8) Supplement these treatments if practicable by collecting and burning the first leaves attacked by the black rot.

"(9) Wherever there has been no previous severe attack, the first 3 suggestions may be omitted, but by following out all the directions the vineyard will be free not only of black rot but of mildew as well."

A new treatment for grape mildew, L. SIPIÈRE (*Compt. Rend., 120 (1895), No. 4, pp. 220–222*).—The author reports the successful use of lysol as a remedy against grape mildew. He was led to make a trial of this material (1) on account of its well-known power as a germicide, (2) its ready solubility in water, (3) its harmlessness, and (4) its cheapness. It was used in solutions varying in strength from 0.001 to 0.01, the best results being obtained when used in the strength of 0.005, which is obtained by adding 5 gm. of lysol to every liter of water. When used in the strength recommended it proved as efficacious as Bordeaux mixture and was more economicalby 28 per cent. Three sprayings are necessary, and in France the proper time for their application is April 20 to 30, May 1 to 8, and June 1 to 8. When used in a strength of 0.004 it rids the leaves of all insects or larvæ that may be on them, and it may be used to rid the vine of all kinds of parasites.

The author thinks lysol will prove equally as effective against oïdium as it is shown to be against the mildew.

A laboratory of plant diseases, C. W. WOODWORTH (*California Sta. Rpt. 1893 and 1894, pp. 435, 436*).—A description is given of the laboratory of the University of California for the especial study of plant diseases.

Apple canker (*Gard. Chron., 17 (1895), ser. 3, p. 242*).—A controversial article in which the author thinks conditions of planting and natural hardiness have more to do with the disease than fungus attacks.

The canker of larch (*Oesterr. forst. Ztg., 13 (1895), No. 2, pp. 11, 12*).—A popular article on the diseased condition due to *Peziza wilkommii.*

Concerning Nectria ditissima, F. BANDISCH (*Centbl. Ges. Forstw. Wien, 21 (1895), No. 2, pp. 51–55*).—A popular article on the cause of canker in trees.

Root knots of fruit trees and vines, C. W. WOODWORTH (*California Sta. Rpt. 1893 and 1894, pp. 436–440, pl. 1*).—This article is a revised and enlarged reprint from Bulletin 99 of the station (E. S. R., 4, p. 563).

Hexenbesens (*Oesterr. forst. Ztg., 13 (1895), No. 2, p. 12*).—A description of witches broom of a 90-year-old pine tree.

A vine disease of Chile, A. GIRARD (*Rev. Vit., 2d ser., 3 (1895), No. 64, pp. 233–236*).—It is attributed to *Margarodes vitium.*

The relationship of Cæoma nitens and Puccinia peckiana, G. P. CLINTON (*Bot. Gaz., 20 (1895), No. 3, pp. 116, 117*).—Notes are given on the identity of the two forms and a discussion of the proper nomenclature for the fungus.

New species of Ustilagineæ and Uredineæ, J. B. ELLIS and B. M. EVERHART (*Torrey Bul., 22 (1895), No. 2, pp. 57–61*).—Technical descriptions are given of 14 new species, divided as follows: *Ustilago,* 1; *Entyloma,* 1; *Uromyces,* 2; *Puccinia,* 9; and *Æcidium,* 1.

Plant diseases caused by cryptogamic parasites, K. FREIHERR v. TUBEUF (*Pflanzenkrankheiten, durch kryptogame Parasiten verursacht. Berlin: J. Springer, 1895, pp. 600, figs. 306*).

How to distinguish fungus diseases of carnations, B. D. HALSTED (*Florists' Exchange, 7 (1895), No. 14, pp. 293, 294*).—Paper read by the author before the American Carnation Society. Carnation rust, leaf spot, black spot, ring mold, and bacteriosis are described. Copper sulphate 1 to 1,000 solution has given good results against these diseases and does not have the lime which is often objectionable in Bordeaux mixture.

Effect of treating barley seed for smut, M. HOLLRUNG (*Fühling's landw. Ztg., 44 (1895), No. 2, pp. 49–53*).

Experiments in treating potato blight, A. SEMPOTOWSKI (*Deut. landw. Presse, 22 (1895), No. 6, p. 51*).—A brief report on the use of Bordeaux mixture and sulphate of iron and lime.

Spraying of apple trees, J. T. STINSON (*Arkansas Sta. Rpt. 1894, pp. 23–44, fig. 1*).—A reprint from Bulletin 26 of the station (E. S. R., 5, p. 1076), giving details of experiments conducted for the prevention of apple scab and bitter rot.

Lysol as a fungicide for vines, L. MANGIN (*Jour. Agr. Prat., 59 (1895), No. 7, pp. 245, 246*).

The preparation of ammoniacal copper carbonate solution, C. L. PENNY (*Delaware Sta. Rpt. 1893, pp. 172–183, figs. 2*).—A reprint from Bulletin 22 of the station (E. S. R., 5, p. 1077).

ENTOMOLOGY.

The San José scale in New Jersey (*New Jersey Stas. Bul. 106, pp. 24, figs. 5*).—This bulletin treats of the introduction and spread of *Aspidiotus perniciosus* in New Jersey, its life history, description, enemies, and treatment. The scale was introduced on Kelsey plum trees from California in 1886 or 1887 by two nurseries, and spread rapidly, attacking other fruits as well, especially pears. In 1889 or 1890 the first scaly stock was distributed from these nurseries to different parts of New Jersey and other States. In New Jersey the scale has not been found on the red shale soil which occupies the northern half of the State, although south of this it has been found in every county. As California fruit, pears in particular, are frequently infested by the scale, it is urged that great care be taken to avoid a further infection with the pest.

The scale is described in detail in the various stages of growth, and the life history given, the information being chiefly compiled.[1]

It was found that many deciduous fruit trees were attacked by the scale, though not all to the same extent. Currants, gooseberries, rosebushes, elms, and English walnuts were also found infested. Apples, pears, plums, and cherries are attacked in preference. Idaho and Louisiana pear trees suffer most, while Keiffer is least likely to be attacked.

The scale was found parasitized by the hymenopter *Aphelinus fuscipennis*, which attacks about 1 per cent of the scales. In addition, 2 species of ladybirds, *Chilocorus bivulnerus* and *Pentilia misella*, feed upon *Aspidiotus*.

It is recommended that every orchard that has been set out within the last 6 years should be thoroughly examined, and if the scales are found they should be brushed off, so far as possible, with a stiff brush. Following this the trees should be liberally pruned and the cuttings burned. The trees should then be washed or sprayed with whale-oil soapsuds, or with the following potash solution: Crystal potash lye, 1 lb.; fish oil, 3 pt.; soft water, 2 gal. To this water should be added to bring the amount up to 15 gal. The application of this insecticide should be made during a mild spell in the winter, and a month later the trees should be sprayed with strong kerosene emulsion. Spraying with diluted kerosene emulsion in the spring when the larvæ are crawling about is also recommended. The importance of carefully inspecting all nursery stock is insisted upon.

Some insects injurious to squash, melon, and cucumber vines, and the asparagus beetle (*New York State Sta. Bul. 75, pp. 409–427, figs. 3, pls. 4*).—This bulletin contains illustrated descriptive, life history, and remedial notes on the squash bug (*Anasa tristis*), squash-vine borer (*Mellitia ceto*), boreal ladybird (*Epilachne borealis*), melon louse (*Aphis cucumeris*), striped cucumber beetle (*Diabrotica vittata*), and asparagus beetle (*Crioceris asparagi*). The investigations were undertaken on Long Island and vicinity, where the insects seemed to be inflicting most damage.

The squash bug was unusually injurious the past season, and experiments were made with carbon bisulphid, pyrethrum powder, and kerosene emulsion for its destruction. Pyrethrum was found to be of no avail and the other insecticides of but little use. Cleaning the fields of rubbish and plowing in the fall is recommended, and in addition distributing bits of boards, chips, leaves, and the like underneath the vines, where the bugs will gather during the day and may be easily captured and killed. Picking the adult bugs from the vines in the early spring is also advised.

The squash-vine borer inflicted more damage than any other of the insects noted. Cutting out the borers as soon as the vines begin to show signs of injury and covering the bases of the vines with earth as far as the third or fourth joint is suggested, and also capturing and killing the moths which may be found sluggishly sitting on the leaves in the evening and early morning. Spraying with arsenites is recommended for the boreal ladybird. Kerosene emulsion or whale-oil soapsuds is advised against the melon louse, and picking and destroying the affected leaves. Against the striped cucumber beetle it is suggested that the hills be protected by covering them with screens or nettings of some kind until the vines have acquired a strong growth, and spraying with the arsenites, or dusting on tobacco dust, air-slacked lime, or a mixture of arsenites and plaster after the beetles have begun their attacks.

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[1] U. S. Dept. Agr., Div. of Ent. Circular 3 (E. S. R., 5, p. 1088).

Against the asparagus beetle applying lime to the affected beds is recommended, and also cutting and burning the old stalks each fall and the young seedlings in the spring. It is also suggested that chickens be allowed to run among the beds.

Report on a so-called disease affecting the orange orchards of Wide Bay, and on insect pests prevalent therein (*Queensland Dept. Agr. Bul. 4, 2d ser., pp. 17*).—This deals with investigations on an affection of oranges called the "Maori orange," in which the fruit was covered to a greater or less extent with a brown stain, frequently obscuring the natural hue of the entire surface. The oranges were usually exceptionally sweet and juicy, but sometimes were black, and in this event the flesh was soft, discolored, and sour. The condition was found to be produced by the mite *Phytoptus oleivorus*, which fed upon the rind of the orange, puncturing the oil cells, from which the oil exuded and was oxidized by the atmosphere, thus producing a resinous dark stain. Treatment by means of a sulphur, soap, and water wash, or a spray of 2 oz. of potassium sulphid dissolved in 2 gal. of soapsuds is recommended. This insecticide should be applied in the spring before the growth commences, again when the fruit is the size of a marble, and later when it is about two thirds grown.

Descriptive, life history, and remedial notes are given on the white scale (*Chionaspis citri*), red scale (*Aspidiotus coccineus*), black scale (*A. ficus*), long mussel scale (*Mytilaspis gloveri*), and 5 species of brown scale (*Lecanidæ*). More persistent effort by fruit growers against injurious insects is urged.

Report of the entomologist, M. H. BECKWITH (*Delaware Sta. Rpt. 1893, pp. 154–171, figs. 7*).—This comprises a reprint of Bulletin 21 of the station (E. S. R., 5, p. 410) and some additional matter. A report is made of experiments with arsenites on several private farms to prevent the depredations of the curculio, the trees being sprayed with London purple, and the resulting fruit being almost entirely free from insect injuries. In another private orchard an experiment was conducted on 180 Abundance plum trees to determine the relative value of jarring and of spraying the trees to protect the fruit from the curculio. One half of the trees were jarred, this treatment being given 15 times, beginning on May 15 and continuing for 3 weeks. The other half of the orchard was given 3 sprayings with a mixture of Paris green and lime in water. Three times as much foliage and fruit dropped from the sprayed trees as from those that were jarred, but the opinion is held that spraying with arsenites is the most economical method of treatment. Two apricot trees were sprayed 3 times with Paris green to protect against the curculio, with beneficial results, although the fruit was severely injured by a fungus which attacked it when nearly ripe.

Descriptive, life history, and remedial notes are given on the elm-leaf beetle (*Galeruca xanthomelæna*), strawberry weevil (*Anthonomus signatus*), wheat-head army worm (*Leucania albilinea*), and strawberry-root aphis (*Aphis forbesi*), which proved destructive in the State. The strawberry-root aphis was especially prevalent and injurious in the neighborhood of Felton, but yielded to treatment with bisulphid of carbon, though the remedy is too expensive to be generally recommended.

Report of the entomologist, J. B. SMITH (*New Jersey Stas. Rpt. 1893, pp. 439–603, figs. 197*).

Synopsis.—This report contains a general review of the work accomplished during the year, brief remarks on special insect outbreaks, and more extensive notes upon the pear midge, pear-tree psylla, wheat-head army worm, strawberry weevil, corn-root webworms, pale-striped flea beetle, and chestnut weevils. The bulk of the report is taken up by a more or less popular paper on the chief beneficial insects.

General review (pp. 439–453).—Notes on the routine work of the office, with special remarks on several injurious insects, particularly the sweet-potato flea beetle, melon louse, onion maggot, wheat-head army worm, pale-striped flea beetle, strawberry weevil, pear midge, a new asparagus beetle, and some cranberry insects. The entomological inquiries and information that were published through the summer in the crop bulletins are quoted.

Pear midge (pp. 453–460).—Notes on the life history and devastations of *Diplosis pyrivora*, and experiments with treatment for it, which have been given in previous publications of the station.

Pear-tree psylla (pp. 460–465).—General life-history notes for *Psylla pyricola*. Scraping off the rough bark of the infested trees and washing the trunks and larger branches with a solution of whale-oil soap in the winter, and in the spring spraying the trees with kerosene emulsion is recommended.

Wheat-head army worm (pp. 465–469).—Notes on the unexpected appearance of *Leucania albilinea*, its life history, and remedies. The larvæ appeared early in July, causing considerable damage to ripening wheat. Later in the season the insects vanished, and are supposed to have returned to their normal food plants, the wild grasses. Plowing infested fields to a depth of 6 in. in the fall and again early in the spring is advised for the destruction of the pupæ.

Strawberry weevil (pp. 470–473.)—Descriptive and life-history notes for *Anthonomus signatus.* Covering strawberry beds by means of newspapers or screens of linen or cloth until the plants are in full bloom is advised, with a view to protecting the flowers until fertilization is accomplished.

Corn-root webworm (pp. 473–478).—Descriptive and life-history notes on *Crambus vulvivagellus*, with accounts of injuries and suggestions for treatment. Fall plowing, with a top dressing of kainit in the spring is advised.

Pale-striped flea beetle (pp. 478–480).—Brief notes on *Systena blanda* and damage inflicted by it. Underspraying with Paris green or London purple and lime as soon as the beetles are noticed is advised, adjacent weeds being also sprayed.

Chestnut weevils (pp. 481–485).—Life history and remedial notes on *Balaninus proboscoideus* and *B. rectus.* Planting of such varieties of chestnut trees as are least attacked, and the destroying of infested nuts as soon as they drop, are recommended.

Beneficial insects (pp. 485–603).—This part of the report comprises general popular remarks on the benefit derived by the farmer from predaceous and parasitic insects, and descriptions of many of the more important species are given in greater or less detail.

Entomology, F. L. WASHBURN (*Oregon Sta. Bul. 33, pp. 16, figs. 2, pls. 2*).

Synopsis.—This bulletin gives descriptive, life-history, and remedial notes on tent caterpillars, the grain plant louse, pear-leaf blister, and clover mite, with directions for making and using Koebele's resin wash.

Tent caterpillars (pp. 1–5).—The larvæ of 3 species of tent caterpillars (*Clisiocampa erosa, C. pluvialis*, and *C. constricta*) are described and remedies advised. The forms were abundant in the Willamette Valley during the season, the two first named species feeding upon various orchard trees, while *C. constricta* confined its devastations to oaks, particularly *Quercus garryana.* *C. pluvialis* was much less common than the two other species. The life history is briefly described and popular descriptions of the larvæ of each species are given. Brewer's blackbirds were found to eat the pupæ, but the hairy caterpillars were little molested by birds. Tachina and chalcid parasites were found to attack the larvæ, and some fungus diseases were also destructive, chiefly to *C. constricta.* Spraying with the arsenites is advised, but more particularly it is urged that the egg masses be gathered from the twigs of the fruit trees in autumn and winter and burned. An illustration on the cover of the bulletin is engraved from a photograph of the larvæ of the 3 species.

The grain plant louse (pp. 6–9).—*Siphonophora avenæ* was quite abundant in the wheat-growing districts, attacking also oats, rye, and mesquite grass. Its history and description are given. Burning stubble, weeds, etc., immediately after harvest, and then cultivating the land and allowing no grass or grain crop in the field the following year, is advised. It is recommended that badly infested wheat and oats be cut while green and used for hay. A lady beetle (*Hippodamia convergens*), syrphus flies, and several hymenopterous parasites were found to reduce greatly the numbers of the lice. An illustration from a micro-photograph is given showing an *Aphidius* parasite in the act of emerging from a dead grain aphis.

The pear-leaf blister (pp. 9–12).—Brief notes on the appearance and life history of *Phytoptus pyri* and the injury caused by it to the foliage of fruit trees. It has been found to be quite common in Oregon, and illustrations are given showing the damage done to leaves and an enlarged figure of the insect. Pruning and burning the infested branches and spraying with kerosene emulsion in the autumn when the mites are migrating are recommended.

The clover mite (pp. 12, 13).—Notes on *Bryobia pratensis*, which is found to be quite prevalent in Oregon, where it infests several kinds of fruit trees in addition to clover and grasses. It is recommended that infested fruit trees be sprayed with kerosene emulsion to which a little sulphur has been added.

Koebele's resin wash (pp. 13–15).—Notes on the preparing of a resin wash, 4 lbs. of resin, 3 lbs. of carbonate of soda, and 1 gal. of water being boiled together until the resin is dissolved, and then 4 gal. of warm water added. One part of this wash to 6 parts of water is recommended for the woolly aphis, and 1 part to 10 or 12 parts of water for other plant lice and the mealy bug. Experiments were made on plum trees infested with hop lice by spraying them with different strengths of the wash. One part of the wash to 15 parts of water destroyed the lice, but did not injure the larvæ of the syrphus flies or lady beetles that were preying upon the lice, and this strength is then recommended for use against these aphides.

Synopsis of the Dipterous genus Phora, D. W. COQUILLETT (*Canadian Ent., 27 (1895), No. 4, pp. 103–107*).

Preliminary studies in Siphonoptera, II, C. F. BAKER (*Canadian Ent., 27 (1895), No. 3, pp. 63–67*).—This part of the paper treats of the family *Pulicidæ*.

The biology of the Lachninæ in the valley of the Vistula, A. MORDWILKS (*Zool. Anz., 18 (1895), No. 46, pp. 74–85*).

Oviposition in Cicada hieroglyphica, J. B. SMITH (*Ent. News, 6 (1895), No. 3, pp. 84, 85*).—Brief note on this species depositing its eggs in the soft rotten wood of a cedar tree.

Successful introduction of humble-bees into New South Wales, A. S. OLIFF (*Ent. Monthly Mag., 2d ser., 6 (1895), No. 63, p. 67*).—An abstract from a letter on the subject.

What insects deserve the protection of foresters, farmers, and gardeners? L. TASCHENBERG (*Welche Thiere aus der Insectenwelt sind dem Schütze der Forstleute, Landwirte, und Gärtner sowie der allgemeinen Berücksichtigung zu empfehlen und warum? Friedländer & S., 1895, pp. 33. Reviewed in Wien. Ent. Ztg., 14 (1895), p. 47*).

A lac insect from Madagascar, A. TARGIONI-TOZETTI (*Bul. Soc. Ent. Ital., 26 (1895), No. 3 and 4, pp. 425–469*).—*Gascardia madagascarensis* is described as a new genus and species, and compared with other lac insects from India.

The bee-eating habit of Phymata erosa, W. METCALFE (*Biol. Rev. Ont., 1 (1893), No. 4, pp. 107–109*).—This insect is considered very injurious to bees, and lists are given of insects eaten by it and by *Reduvius raptatorius*.

Grain insects. R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Rpt. 1894, pp. 126, 127*).—A reprint from Bulletin 29 of the station (E. S. R., 6, p. 538).

The normal habitat of Pediculoides tritici, R. MONIEZ (*Rev. Biol. Nord. France, 7 (1895), No. 4, pp. 148–152*).—Notes on this insect, which is usually found in the stems of cereals, although sometimes it is parasitic upon man.

The potato stalk borer, Trichobasis trinotata, J. B. SMITH (*Ent. News, 6 (1895), No. 4, pp. 120–122, figs. 3*).—Notes on its devastation in New Jersey.

Notes on the cacao beetle, A. B. CARR (*Trinidad Field Nat. Club, 4 (1894), No. 4, pp. 110–112*).—Notes on the habits and devastations of *Steirostoma depressum*.

A new Chilean vine-destroying insect, E. C. REED (*Ent. News, 6 (1895), No. 3, pp. 85, 86*).—An account of *Margarodes trilobitum*, which is described as new.

Italian scale insects affecting the orange, A. BERLESE (*Le Cocciniglie Italiane viventi sugli agrumi, pt. 11, Avellino, 1894, pp. 201, pls. 13; extracted from Riv. Pat. Veg., 3 (1894), Nos. 1–8*).—This part of this elaborate work deals with the genus *Lecanium*.

Spread of Otiorhynchus ovatus, H. F. WICKHAM (*Soc. Ent., 1894, Dec., reprinted in Amer. Nat., 29 (1895), No. 338, pp. 177–179*).

Note on the invasion of locusts of the genera Ephippiger and Barbitistes, J. AZAM (*Bul. Soc. Ent. France, 1895, Feb. 27, pp. XLVII–L*).—The wingless species *Ephippiger terrestris* and *Barbitistes berengueri*, hitherto considered as rare and predaceous, do considerable damage to crops in France.

The gypsy moth in Massachusetts, W. C. WRIGHT (*Garden and Forest, 8 (1895), No. 368, p. 108*).—Urging that owners of comparatively small tracts of land can easily keep the insect in check.

An exterminator for the parasol ant, J. H. HART (*Roy. Bot. Gard. Trinidad, Bul. Misc. Inform., 2 (1895), No. 1, pp. 3–5, fig. 1*).—Illustrated description of a machine for smoking out the nest of this injurious ant, *Œcodoma cephalotes*.

Petroleum against the pourridie and the white grub, L. RAVAZ (*Rev. Vit., 2d ser., 3 (1895), No. 64, pp. 250, 251*).—Account of experiments, with good results in both cases.

Kerosene emulsion, S. B. CARPENTER (*Proc. Ga. Hort. Soc. 1892, pp. 34, 35*).—A popular paper on this insecticide, giving formulas for making it and directions for its application. It is advised that fruit trees that have been weakened by insect attacks be fertilized with sulphates in addition to being sprayed with kerosene emulsion.

Enemies to plant life and remedies, G. SPETH (*Proc. Ga. Hort. Soc. 1892, pp. 64–67*).—General remarks on various injurious insects and plant diseases, with recommendations for spraying with various chemical substances.

Entomological work at the Mississippi Station (*Mississippi Sta. Rpt. 1893, pp. 46, 47*).—A brief report on the nature of the entomological work carried on at the station during the year, giving a short account of the scope and aim of the experiments and investigations, and the bulletins issued.

FOODS—ANIMAL PRODUCTION.

Investigation of food materials, M. E. JAFFA (*California Sta. Rpt. 1893 and 1894, pp. 214–217.*)—This includes analyses of alfalfa hay, wheat, flour, bran, and screenings. The average analyses of these materials produced in California are compared with the averages of Eastern analyses. The alfalfa hay agreed quite closely with the average analysis of the same grown in the East. A comparison of wheat and its products is given as follows:

Average composition of wheat grown in California and the East, and products from the same.

	Number of analyses.	Moisture.	Ash.	Crude protein.	Crude fiber.	Nitrogen-free extract.	Crude fat.	Fuel value per pound.
Whole wheat:		*Per ct.*	*Per ct.*	*Per cent.*	*Per ct.*	*Per cent.*	*Per cent.*	*Calories.*
California grown, average	5	11.35	1.74	11.31	2.60	71.09	2.08	1,399
Eastern grown, average	310	10.05	1.80	11.90	1.80	71.90	2.10	1,419
Fine wheat flour:								
California, average	3	13.81	.47	7.90	....	76.40	1.39	1,627
Eastern, average	22	12.50	.50	11.00	....	74.90	1.10	1,645
Coarse wheat flour (graham):								
California	1	12.12	1.58	8.50	....	75.84	1.96	1,650
Eastern, average	3	13.10	1.80	11.70	....	71.70	1.70	1,625
Wheat bran:								
California, average	4	12.42	5.61	13.44	8.52	56.41	3.74	1,151
Eastern, average	88	11.90	5.80	15.40	9.00	53.90	4.00	1,152
Wheat screenings:								
California, average	2	11.16	2.94	10.06	5.48	67.63	2.72	1,123
Eastern, average	10	11.62	2.91	12.48	4.93	65.11	2.95	1,114

"From an inspection of the data given for California wheat, it will be seen that there is but little variation from the average obtained from 310 analyses of the same food material grown east of the Rocky Mountains. . . .

"The California flour is much poorer in nitrogenous compounds than the Eastern flour of the same quality.

"The same statement applies to graham flour.

"While the percentage of [phosphoric] acid in the ash of the different flours is about the same, amounting to almost one half the ash, when we refer it to the flour as 100, the coarse material shows 0.75 as against 0.23 for the fine flour. This is owing to the total ash in the former case being about three times that obtained for the latter. It must not be supposed that because the coarse or graham flour contains higher percentages of nitrogenous and mineral matter than does the fine flour it is therefore in proportion more nutritious. The increased amounts of these elements come from the bran, very little of which is digested by the human stomach."

"It will be noted that the bran made in California contains considerably less crude protein, or nitrogenous matter, than does the same by-product from the East, as shown in the averages, by the figures 13.44 and 15.40, respectively. The fat percentage is also slightly lower for the California food. . . .

"The wheat screenings of this State, like the bran, contain less of albuminoids."

Gluten feeds, their source, composition, and methods of use, E. B. VOORHEES (*New Jersey Stas. Bul. 105, pp. 24, fig. 1*).—By way of introduction an enlarged cut is given of a corn kernel showing the position of the skin or husk, gluten layer, starch layer, and germ. The skin, germ and starchy parts were separated from 100 gm. of kernels of new corn as nearly as possible, and analyzed with the following results:

Analyses of whole and separate parts of corn kernel.

	Amount secured from 100 parts of original corn.	Water.	Composition of the water-free material.							
			Crude fat.	Crude fiber.	Crude protein.	Crude ash.	Carbohydrates.	Nitrogen.	Phosphoric acid.	Potash.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Original corn	100.00	24.74	4.34	2.02	12.65	1.73	79.26	2.02	0.83	0.47
Skin	5.56	15.29	1.59	16.45	6.60	1.27	75.36	1.06	.23	.88
Germ	10.17	29.62	29.62	2.88	21.71	11.13	4 .79	3.48	6.16	2.91
Starchy and hard part	84.27	21.66	1.54	.65	12.23	.68	85.58	1.96	.35	.17

> "The germ, although only about 10 per cent of the whole kernel, contains 65 per cent of the fat, 61½ per cent of the mineral matter, 71 per cent of the phosphoric acid, 60 per cent of the potash, and 16½ per cent of the nitrogen, or protein. The remaining portions are characterized, the skin by its content of fiber, 51 per cent of the whole, and the starchy part by its carbohydrates, of which it contains nearly 90 per cent of that in the whole grain."

A brief explanation is given of the process by which the starch is separated commercially and the various by-products obtained:

> "The residue in this manufacture may consist either of one product, a mixture of the gluten, germ, and hulls, or of three, when the gluten, germ, and hulls are each separated. . . . The entire residue is in color brighter yellow than corn meal, and of a much more bulky character, owing to the presence of a larger proportion of bran; the trade name of this product is gluten feed. The gluten is distinguished by a higher content of both protein and fat, and a bright yellow color, and is called gluten meal. The germ is more bulky than the meals, shows a high content of crude fat, and is called germ meal or germ food. The hulls are very bulky, show a high content of crude fiber, and are usually sold as corn bran."

Samples of these various by-products from corn were obtained from dealers in the State and directly from manufacturers, and analyses of these are given in the bulletin. These are classified as follows: (1) Gluten feed, (2) gluten meal, (3) grano gluten feed, (4) corn oil meal and cake, and (5) corn germ meal and corn bran. The trade names of the materials analyzed were as follows: Chicago gluten feed, Peoria gluten feed, Buffalo gluten feed, dry gluten feed, Chicago maize feed, cream gluten meal, King gluten meal, Iowa golden gluten meal, gluten meal (flour), Hammond gluten meal, Chicago gluten meal, grano gluten feed, corn oil meal, corn oil cake, corn germ food, germ meal, corn bran, corn hulls, and analyses are also given of hominy chop and cerealine feed.

These materials as classified in the bulletin, with the possible exception of grano gluten feed, show very wide variations in composition. For instance, the gluten meals on an average contained somewhat more fat and about one half more protein than the gluten feeds, but the Chicago gluten meal "contains less than half as much fat and about 60 per cent more protein than the gluten feeds." The Chicago maize feed, which is classed with the gluten feeds, contains about one third less fat[1] than the other gluten feeds. The corn germ food contains three and a half times as much fat as the product from another factory sold under the name of germ meal, and the corn hulls have only one half as much fat as the corn bran. These variations in composition and the confusion in regard to names leads the author to suggest that—

> "Unless some good reason exists from the manufacturers' standpoint for the separation of the various parts of the corn, general use would be promoted by making but one product, which should consist of the total residue. It would relieve the purchasers of the uncertainty as to composition, reduce the danger liable to result

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[1] The oil is said to have been partially extracted from this material.—ED.

from the careless feeding of the more highly concentrated parts of the residue, and abolish the necessity of a study of comparative values as now manufactured."

Statements are made in regard to the palatability and feeding value of these different feeding stuffs and suggestions regarding their use in compounding rations.

The determination of the ash, phosphoric acid, and potash in the whole kernel and in the various by-products is given as follows:

Ash constituents in corn and its by-products.

	Ash.	Phosphoric acid	Potash.
	Per cent.	*Per cent.*	*Per cent.*
Corn	1.50	0.70	0.40
Buffalo gluten feed	.87	.34	.08
Gluten meal	1.29	.56	.07
Chicago gluten meal	.89	.35	.06
Corn oil meal	2.28	1.36	.14
Corn bran	.81	.24	.06

"With one exception the original corn contains more total ash, and more phosphoric acid, and in every case more potash than any of the products derived from it as feeds."

In conclusion remarks are made on the value of the fertilizing ingredients of different feeding stuffs, and a table is given showing the pounds of fertilizing ingredients in a ton of a number of different cereals and by-products.

Feeding experiments with horses (*New Jersey Stas. Rpt. 1893, pp. 179–187*).—This is a continuation of the experiments in feeding horses reported in Bulletin 92 of the station (E. S. R., 4, p. 742). Two teams of horses on the college farm were divided into 2 lots, 1 horse from each team being in each lot. Both lots received alike 8 lbs. of timothy hay and 6 lbs. of corn. In addition lot 1 received 6 lbs. of dried brewers' grains, while lot 2 received 5 lbs. of wheat bran and 1½ lbs. of new-process linseed meal per head daily. The grain for each lot was mixed and fed in 3 portions, morning, noon, and night. The corn was at first fed whole, but afterwards ground. The experiment lasted 6 months, from June 1 to December 1, and was preceded by a preliminary trial of 1 week. All of the animals performed similar work. The horses were weighed each week, and a record is given of the changes in weight, food eaten, and general condition.

"The weights of the animals remained remarkably uniform. The difference between highest and lowest did not exceed 75 lbs. in any case, the lowest recorded occurring in July, except for horse No. 3, whose final weight was the lowest. The average weight for the 6 months is practically identical in all cases with the average weight of the first month, though it is lower in all cases than the first weight recorded, and is uniform for both lots.

"The uniformity in the amount of the food consumed and in the weight of the animals, in connection with the work performed, indicates no material difference in the usefulness of the two rations used. Both were entirely satisfactory."

The cost of the rations is based on the following prices: Timothy hay, $18; wheat bran, $17.50; corn meal, $22; dried brewers' grains,

$17; and linseed meal, $29 per ton. At these prices the cost of the brewers' grain ration was 19.8 cts. per day for horse 1, and 18.9 cts. for horse 3; and the wheat-bran ration, 20.8 and 22.3 cts., respectively.

"It is observed that the cost of the daily rations used is much less than is ordinarily charged for feeding work horses. . . .

"That is, for the 6 hardest-working months of the year a farm horse of 1,000 lbs. live weight may be fed for $30.84, when dried brewers' grains furnish the bulk of the necessary protein, and for $33.49 when wheat bran and linseed meal are the chief sources of this nutrient; on the basis of actual cost of the rations only, the brewers'-grains ration is slightly more satisfactory, or 8.6 per cent cheaper than the wheat-bran ration. When the fertility value of the dried grains, wheat bran, and linseed meal is regarded as of importance, the differences in the rations are less marked."

Mention is made of a market gardener in the State who reports saving about 20 per cent on the cost of keeping horses by feeding a ration similar to that given to lot 1. Assuming that the cost of feeding the horses and mules of the State is 20 per cent higher than it need be, which is believed to be a conservative estimate, "the expense of feeding the horses of the State for the 6 working months would be reduced by $700,000 if more rational measures were adopted."

Fodders and feeds (*New Jersey Stas. Rpt. 1893, pp. 158–178*).—Analyses are given of green crimson clover, cowpea vines, corn stalks, corn fodder, shelled corn, sugar beets, corn cob, corn meal, gluten meal, gluten feed, brewers' grains, wheat bran, cotton-seed meal, linseed meal, rice polish, and Paine's stock feed; the market prices of a large number of commercial feeding stuffs from 1891 to 1894; an article on corn stalks and straw as hay substitutes, reprinted from Bulletin 96 of the station (E. S. R., 5, p. 499); and the average composition of a large number of feeding stuffs, largely compiled.

The relative values of winter and spring wheat bran, A. T. NEALE and C. L. PENNY (*Delaware Sta. Rpt. 1893, pp. 16–18, 191*).—Analyses of 4 samples of wheat bran from spring, winter, and local wheat, with a statement of the weight per double bushel, the selling price, and the calculated value according to the station's basis of valuation. In the latter respect the local product was below the others. The heavier bran was valued the highest.

Feeding stuffs, C. L. PENNY (*Delaware Sta. Rpt. 1893, pp. 191, 192*).—Analyses of crimson clover straw, crimson clover chaff, crimson clover seed, peavines (green), gluten feed, distillery corn feed, and wheat bran.

An easy method for detecting a common adulterant of ground pepper D. MARTELLI (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 53–56*).

Fruit as an article of diet and as a medicinal agent, J. P. H. BROWN (*Proc. Ga. Hort. Soc. 1892, pp. 35–37*).—General and popular remarks on the healthfulness of a fruit diet, different fruits and vegetables being recommended for various minor disorders of the system.

The feeding of farm animals, E. W. ALLEN (*U. S. Dept. Agr., Farmer's Bul. 22, pp. 32*).—This is a popular bulletin on the principles of feeding; feeding standards; maximum, minimum, and average composition of the principal feeding stuffs; calculation of the digestible materials in a large number of common feeding stuffs; calculation of rations for cows, steers, pigs, etc.; the origin of by-products used as feeding stuffs; preparation of food; and wheat as a food for animals.

Stock feeding, G. L. TELLER (*Arkansas Sta. Rpt. 1894, pp. 137–170*).—A reprint of Bulletin 30 of the station (E. S. R., 6, p. 663).

Further notes on the use of peanut oil as a substitute for milk fat in calf feeding, M. PETERSEN (*Braunschw. landw. Ztg., 63 (1895), No. 3, p. 10*).

Feeding for milk (*Mississippi Sta. Rpt. 1893, pp. 30–32*).—Short accounts of work previously published in Bulletins 13 and 15 and reprinted in the Annual Reports of the station for 1890 and 1891 (E. S. R., 2, pp. 362, 658; 3, pp. 166, 875).

Salting cows (*Mississippi Sta. Rpt. 1893, p. 32*).—A reprint from the Annual Report of the station for 1888 (E. S. Bul. 2, pt. 1, p. 108).

Milking (*Mississippi Sta. Rpt. 1893, pp. 32, 33*).—A reprint from the Annual Report of the station for 1888 (E. S. Bul. 2, pt. 1, p. 108).

The preparation of food for swine, WERNER (*Braunschw. landw. Ztg., 63 (1895), No. 4, pp. 14, 15*).—Grinding and steaming grain, the preparation of potatoes and Jerusalem artichokes and roots, the effect of different foods on character of flesh and lard, and the amounts of different foods required to produce 1 kg. of increase in live weight are briefly discussed.

VETERINARY SCIENCE AND PRACTICE.

Cerebro spinal meningitis in horses, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 23–39*).—The subjects treated are the prevalence, symptoms, *post-mortem* appearances, theories as to the causes, and experimental studies on the causes of this disease.

The following food stuffs were suspected of having caused the disease: Good corn silage, decayed corn silage, musty-blade fodder, musty-top fodder, musty oats, and wheat bran. All of these foods were fed to animals believed to be susceptible, but with negative results. German veterinarians believe that wheat cockle (*Agrostemma githago*) under certain conditions that are not well understood causes death in horses. Hens fed largely on ground cockle died, their symptoms being those of narcotic poisoning. But another flock of fowls ate perfectly dry cockle seed without visible injury; grain screenings containing a large proportion of cockle were fed to a colt with negative results. The results were also negative when screenings were first fermented and afterwards dried and ground.

To determine whether stinking smut of wheat (*Tilletia lævis*) had any connection with meningitis, wheat bran infested with this fungus was fed to a horse with negative results. The feeding of oats containing *Aspergillus fumigatus* also gave negative results.

Hydrophobia in farm stock, A. T. NEALE and P. GIBIER (*Delaware Sta. Rpt. 1893, pp. 48–59, fig. 1*).—Two outbreaks of hydrophobia in Delaware are noted. A general discussion of hydrophobia and an abstract of the German laws on the subject are given, as well as brief notes on a horse and dog successfully treated with vaccine after being bitten.

"A temperature of 70° C. (158° F.) will destroy the microbe [of hydrophobia] after a few minutes' exposure; desiccation destroys it in a few hours . . . and acids and disinfectants destroy it easily; but it resists putrefaction for a time and keeps its virulent properties for several weeks when it is kept cold. . . . The virus of hydrophobia can be put with impunity in contact with the skin or taken through the mouth without causing any disturbance. . . . The almost unique way of propagating the disease is by a bite. . . . It is not necessary to submit the stables or yards in which cattle affected with rabies have been confined to the same disinfection which would be required for anthrax or glanders. Washing with hot water containing a small quantity of sulphuric acid, followed by spontaneous desiccation, will be sufficient. . . . Cauterization, even when applied a few moments after the bite with the strongest acids, caustic, or cautery, is not sufficient to protect against the infection. . . . I would rather suggest that the wound be washed with a [1 per cent] solution of bichlorid of mercury, peroxid of hydrogen, or any strong disinfectant."

Investigations concerning bovine tuberculosis, D. E. SALMON (*U. S. Dept. Agr., Bureau of Animal Industry Bul. 7, pp. 178, pls. 6*).—This bulletin consists of articles on the following subjects:

Clinical and pathological notes on a herd of 60 cattle treated with tuberculin, F. L. Kilbourne, E. C. Schroeder, and T. Smith (pp. 7–74).—In a herd of 60 animals tested with tuberculin this method of diagnosis acted correctly, indicating the presence or absence of tuberculosis in 86⅔ per cent of the cases. Of 53 tuberculous animals, 47 were affected with tuberculosis of the organs situated in the chest. "Infection by way of the intestinal tracts was indicated in 14 cases by tuberculosis of a smaller or larger number of mesenteric glands."

Further experimental observations on the presence of tubercle bacilli in the milk of cows, E. C. Schroeder (pp. 75–87).—Of 19 specimens of milk obtained from the general milk supply of Washington one sample contained the bacillus of tuberculosis in sufficient numbers to produce the disease in 1 of the 2 guinea pigs injected with it.

Studies in bovine tuberculosis with special reference to prevention, T. Smith (pp. 88–128).—The author finds that the extent and rapidity of the disease of the lungs depends at least in part upon the number of tubercle bacilli inhaled either within short or long periods of time, and that tuberculosis of the lungs is not necessarily associated with any other recognizable lung affection as a preëxisting favoring condition.

Some practical suggestions for the suppression and prevention of tuberculosis, T. Smith (pp. 129–146).—The danger of infection from different sources is summarized by the author as follows:

"(1) Fully nine tenths of all diseased animals have been infected by inhaling the tubercle bacilli, dried and suspended in the air.

"(2) Fully one half of all diseased animals have been infected by taking tubercle bacilli into the body with the food. Frequently both food and air infection are recognizable in the same animal.

"(3) Animals are infected, though rarely, during copulation. In such cases the disease starts in the uterus and its lymph glands or in the sexual organs and corresponding lymph glands of the bull.

"(4) Perhaps from 1 to 2 per cent of all calves are born tuberculous."

The presence of tuberculosis in one herd is not believed to endanger other herds near by which do not mingle with the diseased herd in pasture or stable. In the absence of the tuberculin test the stockman is advised to remove from his herd and have destroyed—

"(1) All animals which show emaciation with coughing and any suspicious discharges from the nose.

"(2) Those animals with enlarged prominent glands about the head (in front of the eyes, under and behind the lower jaw), all enlarged glands in front of the shoulder, in the flanks and behind the udder.

"(3) Animals with suspected tuberculosis of uterus and udder."

Tuberculin and its use, A. E. de Schweinitz (pp. 159–178).—"The danger of injecting tuberculin into healthy animals in moderate quantity is slight. In healthy guinea pigs I have found that an injection of a dose 20 times as large as that required to produce a reaction in a diseased cow may kill, but does not always do so."

Examinations were made of samples of cow's milk (1) the day before injection, (2) the day after injection when the temperature was about at the maximum, and (3) a day or two after injection.

"In general the results show a decrease in total solids in the [milk of] tuberculous animals after the injection. In the healthy animals there is also a slight decrease in solids, but not as much as in the diseased animals.

"There is also a decided variation in the proportion of fat before and after injection of the tuberculin as well as albuminoids and sugar. The fat and sugar decrease, the albuminoids show a slight increase. The latter may, in part, be attributed to the presence of a small amount of tuberculin in the milk. This variation in the constituents of the milk would indicate that while under examination with tuberculin the milk of the animals should either not be used at all, or close attention paid to the fact that tuberculin will cause such variations. These results are but preliminary to a more extended examination."

Bovine tuberculosis, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 81–102*).—The condition of public sentiment and the prevalence of bovine tuberculosis in the State are discussed at length. Ten herds, comprising 344 cows, were examined by the station veterinarian. Of these 89 animals were condemned. A rise of 1.5° in the temperature of an animal was sufficient for condemnation. The average expense for tuberculin exceeded 50 cts. per head. "About 1 cow in every 10 thus far killed and examined by this station for tuberculosis had a consumptive udder."

The method of disinfection followed by the station was to spray the stables with a 1 per cent solution of chlorid of lime in a spraying pump worked under a pressure of more than 100 lbs. to the square inch. A small quantity of whitewash was added to the solution in order to mark the thoroughness of the work. This solution "when driven through the air by heavy pressure charges the barn so heavily with chlorin gas that laborers are sorely tried while carrying out the work. A barn thus sprayed and closed for a few hours must be regarded as sterilized as thoroughly as circumstances will allow." Tabulated data give the temperature records of the animals tested with tuberculin.

Anthrax, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 60–81*).—This general discussion of anthrax is largely a reprint of Bulletin 20 of the station (E. S. R., 5, p. 413). The use of Pasteur's preventive vaccine for anthrax is discussed, and experiments in which the use of vaccine failed to give immunity against the disease are briefly described. The Delaware law relative to the reduction of infectious and contagious diseases among the lower animals is given.

Ringworm (Trichophyton tonsurans) in cattle, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 59, 60*).—An outbreak of ringworm, followed in several instances by death, is noted. "Mercurial ointments, spirits of camphor, salicylic acid, and especially tincture of iodin are recommended for local application."

Texas or splenic fever, A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 39–47*).—A reprint of Bulletin 23 of the station (E. S. R., 6, p. 81).

The use of Koch's lymph in the diagnosis of tuberculosis in cattle, J. NELSON (*New Jersey Stas. Rpt. 1893, pp. 209–285, dgms. 5*).—This article was printed as Bulletin 101 of the station (E. S. R., 6, p. 332).

Diseases of stock, R. R. DINWIDDIE (*Arkansas Sta. Rpt. 1894, pp. 1–22*).—A reprint of Bulletin 25 of the station (E. S. R., 5, p. 995).

Diseases of man and of domestic animals spread by dogs, O. HENNING (*Agl. Jour. Cape Colony, 8 (1895), No. 2, pp. 55, 56*).

Veterinary work of the Mississippi Station (*Mississippi Sta. Rpt. 1893, pp. 43–46*).—Reference is made to publications of the station treating of anthrax or charbon, diseases of sheep and calves, dehorning, glanders, and colic. Preventive treatment and symptoms of anthrax are discussed, and prescriptions to be used in the treatment of cramp colic and wind colic are given.

DAIRYING.

Fluctuation in the volatile acids of butter fat, C. L. PENNY (*Delaware Sta. Rpt. 1893, pp. 183–191*).—In this study the volatile fatty acids were determined in samples of butter from a large creamery taken at frequent intervals from September 16, 1891, to December 22, 1893. During the first year the samples were kept some time, often a year or more, before the volatile acids were determined. After that the samples were saponified, usually on the same day the butter was made. In all 118 samples were tested, and the results are tabulated, with the averages by months. The changes by months are also illustrated by a diagram.

"Inspection of the table shows that the results vary greatly and very suddenly within the same month, frequently much more than the averages of successive months; and the same month in 2 successive years shows wide differences probably due to more permanent causes. There would seem to be no relation between season and percentage composition of butter fat that is not overbalanced and entirely hidden by other disturbing causes. But following the changes from month to month it will appear that there is great uniformity of tendency. At certain times in the year the percentage of volatile acids, whatever it may happen to be for the year and under the particular circumstances, falls off rapidly, at other times it increases slowly and again rapidly. The falling off in percentage of volatile acids appears to be relatively abrupt. At a particular time of the year we can not say with any approximation to certainty what the proportion of volatile acids will be, but we may say with some confidence that at a certain season it will be increasing, at another decreasing. From July to September in the year 1892 this proportion is quite different from what it is during the same months of 1893, yet the rate of increase is substantially the same and also the same as that found by Spallanzani.[1] From September there is a rapid decline, continuing in our experience till October or November, in [Spallanzani's] to December. There is then an almost continuous rise till June, when there is an instant falling off to July. The two maximum points are September and June, the two minimum points from October to December, or late autumn, and July. The fact that the results for the same month of different years vary so rather emphasizes these tendencies. Then if the quality of butter improves with a higher percentage of volatile acids, the best butter ought to be made in June and in September, the poorest in July and in the late autumn. The minimum percentage in the above table is 21.77 on October 3, 1891, the maximum 32.23 on May 4, 1893. . . . The results are believed to show as fairly as may be the effect of season alone on the composition of butter-fat. The extreme fluctuations here reported are naturally less wide than might be found between samples from different individual cows."

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[1] Staz. Sper. Agr. Ital., 32 (1889), March.

A scheme for paying for cream by the Babcock test in butter factories, J. M. BARTLETT (*Maine Sta. Bul. 15, 2d ser., pp. 4, pl. 1*).—In this bulletin a popular detailed description is given of the method of carrying out the payment for cream at creameries on the basis of its weight and fat content, instead of its volume alone. The cream is to be weighed by the collector and a small sample taken by means of a sampling tube, and placed in a 2-oz. bottle marked with the patron's number. Upon arrival at the creamery the small sample bottles are emptied into the composite sample jars of the respective patrons, and these composite samples preserved by means of bichromate of potash for 2 weeks (4 weeks in winter), when they are tested by the Babcock tester. The method of paying for the cream from the results of the test is illustrated.

In the sale of milk, which offers the more profitable market, the creamery or a milk association of Philadelphia? A. T. NEALE (*Delaware Sta. Rpt. 1893, pp. 19–21*).—The financial record is given by months of two dairymen, one of whom sent his milk to Philadelphia and the other to a creamery which paid by test. The first sent 33,214 qts. of milk to Philadelphia during the year, receiving $1,027.23 net or 3.1 cts. per quart. The milk averaged 4.3 per cent of fat for the year. The second sent 33,214 qts. of 5 per cent milk to the creamery, receiving $1,076.84. Had the first sent his 4.3 per cent milk to the creamery he would have lost $101.04, and had the second sent his 5 per cent milk to the city he would have lost $49.63. "That is, in the city trade, no distinction in price is made between a product with 5 per cent and one with 4.3 per cent of butter. Yet on 33,214 qts. of milk, this difference on the creamery basis amounted to $150.67."

Test of hand separator, C. L. PENNY (*Delaware Sta. Rpt. 1893, p. 192*).—The power required to run a DeLaval Baby Separator at the rate of 41 turns per minute was found to be 0.1 horsepower. Run at 47 turns per minute the skim milk contained 0.1 per cent of fat.

The preparation of a new drink from milk, A. BERNSTEIN (*Deut. landw. Presse, 22* (*1895*), *No. 14, pp. 119, 120*).

Inoculation in the manufacture of koumis, P. SPALLANZANI (*Staz. Sper. Agr. Ital., 28* (*1895*), *No. 1, pp. 43–52*).

Flaack's milk sterilizer (*Deut. landw. Presse, 22* (*1895*), *No. 7, pp. 56, 57*).

The Patterson method for determining the amount of butter-fat in milk (*Mississippi Sta. Rpt. 1893, pp. 48–50*).—An account of a modification of the Beimling method, previously described in Bulletin 21 of the station (E. S. R., 4, p. 267).

AGRICULTURAL ENGINEERING.

Tile drains, S. M. TRACY (*Mississippi Sta. Rpt. 1893, pp. 37–40*).—Accounts are given of attemps at the station during 1889–'93 to tile drain "creek bottom lands underlaid by a very heavy, almost impervious, black soil and clay; black prairie soils; and 'seepy' clay hillsides." The effect of the tiles was evident not only in removal of excess of water but in mitigation of drought on soils subject to it.

"When the drains have been less than 500 ft. in length we have found 3-in. tile ample for draining the ground quickly and thoroughly, but for longer runs we have found it necessary to use 4-in. for the lower part of the drains, and this has been of sufficient size for the extremities of the longest runs, about a quarter of a mile. The tile have been put into the ground to an average depth of 3½ ft. and the expense of the work, including the cost of tile, digging the ditches, laying and covering the tile has been 51 cts. per running rod. Three-inch tile have cost, including freight, about $18 per thousand feet, which is nearly three times the cost of such tile in Illinois and other Northern States. . . .

"The station fields which have been tile drained have increased their annual yield fully 50 per cent as a result of the work, and such drains will be found a profitable investment on all soils which remain wet until late in the spring on account of their compact subsoil, or which are rendered heavy and 'sour' by continued seepage from surrounding hill lands."

The artesian wells of southern Wyoming, their history and relation to irrigation, J. D. CONLEY (*Wyoming Sta. Bul. 20, pp. 87–122, figs. 2*).—The conditions necessary for an artesian supply are explained; the extent of artesian irrigation in San Bernardino, California, and the San Luis Valley, Colorado, is noted; and a detailed account of the artesian wells of southern Wyoming, principally in the vicinity of Laramie and Rawlins, is given, including data relating to cost, flow, strata pierced, and analyses of the water.

In an appendix is given the official analyses of water from artesian wells sunk by the Union Pacific Railway Company in Wyoming.

Brush and stone drains (*Cult. and Country Gent., 1895, Feb. 7, p. 103, figs. 2*).—Popular directions for the construction of these drains.

Subirrigation (*Rural New Yorker, 1895, Feb. 2, p. 66*).—A system of subirrigation by means of tile drains is described, which is claimed to overcome most of the objections to irrigation by means of tiles.

The trials of oil engines at Cambridge (*Jour. Roy. Agr. Soc. England, 3d ser., 5 (1894), No. 20, pp. 696–738, figs. 25*).

The animal as a prime mover, II, R. H. THURSTON (*Jour. Franklin Inst., 139 (1895), No. 830, pp. 100–121*).—A study of power and efficiency.

Electricity as a motive force for plows, RINGLEMAN (*Jour. Agr. Prat., 59 (1895), No. 3, pp. 89–99, figs. 5*).

Irrigation principles, W. HALL (*Irrigation Age, 8 (1895), No. 2, pp. 45–47; No. 3, pp. 83–85*).

Beet harvesting machine, BEHRENS (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 4, p. 57, figs. 2*).

Petroleum motor in agriculture, BRUTSCHKE (*Wochenschr. Pom. ökon. Ges., 25 (1895), No. 2, pp. 14, 15*).

Results of trials of potato diggers, F. SCHOTTE (*Jahrb. deut. landw. Ges., 9 (1894), pp. 395–410, figs. 15*).

Machines for peeling potatoes, F. SCHOTTE (*Jahrb. deut. landw. Ges., 9 (1894), pp. 389–394, figs. 4*).

Plans for a piggery, MALOCHOWSKI (*Jahrb. deut. landw. Ges., 9 (1894), pp. 411–416, figs. 3*).

STATISTICS.

Reports of director and of treasurer of Arkansas Station (*Arkansas Sta. Rpt. 1894, pp. V–VIII, 84, 85*).—A brief review of the year, a financial statement for the fiscal year ending June 30, 1894, and a list of the bulletins published by the station since July, 1891.

Arkansas Southern Branch Station, R. L. BENNETT (*Arkansas Sta. Rpt. 1894, pp. 87–89*).—Brief general remarks on the work at this substation.

Financial statements for 1893 and 1894 (*California Sta. Rpt. 1893 and 1894, pp. 495, 496*).—Financial statements for the fiscal years ending June 30, 1893 and 1894.

Report of treasurer of Delaware Station (*Delaware Sta. Rpt. 1893, pp. 4, 5*).—This is for the fiscal year ending June 30, 1893.

Reports of director and of treasurer of the Mississippi Station for 1893 (*Mississippi Sta. Rpt. 1893, pp. 1–6, 46, 52*).—Report of the treasurer for the fiscal year ending June 30, 1893, and brief outlines of the work of the year in the different departments at the station and at the branch stations at Holly Springs, Lake, and Booneville.

Reports of directors and of treasurers of New Jersey Stations (*New Jersey Stas. Rpt. 1893, pp. 1–16, 191–199, 203–206*).—Brief general remarks on the work of the year, treasurers' reports for 1893, and legislation relative to the station and fertilizer control.

Work of American experiment stations, E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 42–44*).—A brief survey of the experiment station movement in this country, with remarks on the scope and purposes of station work, and the value of their studies and investigations from a practical and scientific point of view.

Report of observations made on European agricultural schools and experiment stations, 1892–'93, E. W. HILGARD (*California Sta. Rpt. 1893 and 1894, pp. 27–41*).—An interesting account of observations made in Germany and Switzerland.

MISCELLANEOUS.

The beginnings of agriculture, L. BOURDEAU (*Pop. Sci. Monthly, 1895, Mar., pp. 678–688*).

Socialism and agriculture in France, D. ZOLLA (*Ann. Agron., 21 (1895), Nos. 2, pp. 49–75; 3, pp. 97–122*).

Agriculture in the immediate vicinity of Berlin, ORTH (*Jahrb. deut. landw. Ges., 9 (1894), pp. 132–136*).

Notes on the agricultural features of the Congo, F. HAMBURSIN (*Ingén. Agr. Gembloux, 5 (1895), No. 7, pp. 325–330*).

Crops and live stock in Ontario (*Ontario Bureau Industries Bul. 52, pp. 16*).—Statistics on the condition of crops, live stock, etc., with extracts from returns of correspondents.

NOTES.

Arizona Station.—A greenhouse 24 by 80 ft. is in process of construction. At the Mesa substation deciduous, fruit, and ornamental trees have been planted, and at the Willcox substation tests are about to be made of pumping with a gasoline engine for irrigation purposes.

Indiana Station.—George R. Ives, formerly assistant agriculturist, has severed his connection with the station.

New Hampshire College.—On March 14 the college herd was reduced by the sale of 25 head at public auction. All the animals thus sold had been twice subjected to the tuberculin test. The State legislature has appropriated the sum of $25,000 to be expended by the College of Agriculture and Mechanic Arts in the building and furnishing of a residence and industrial hall for women.

South Dakota Station.—At the January meeting of the regents of education, J. H. Shepard, chemist of the station, was appointed director, *vice* Lewis McLouth, relieved; H. B. Mathews, meteorologist, was made assistant chemist, and the station council was reorganized and its powers and duties somewhat enlarged. Its number has been increased by the addition of one member from each of the governing boards, G. J. Coller being elected regent member and O. T. Grattan trustee member. L. C. Corbett, horticulturist, has been elected secretary and vice director of the council.

Wisconsin Station and College.—The following changes have been made in the governing board of the station: H. B. Dale, C. Keith, and N. D. Fratt have retired and are succeeded by O. H. Fethers, of Janesville; F. W. Challoner, of Oshkosh, and W. A. Jones, of Mineral Point.

The board of instruction of the college has been changed as follows: C. H. Diener has been appointed assistant in agricultural physics; F. E. Baker, assistant in judging live stock; F. Cranefield, assistant in horticulture; G. P. Pfeiffer, assistant in farm dairying; A. J. Schoenmann, assistant in milk testing; W. A. Voigt, instructor at pasteurizer; and T. A. Stanley, instructor in farm bookkeeping, has been succeeded by O. M. Taylor; E. J. Bennet, instructor in farm dairying, has been succeeded by J. D. Clark; W. E. Doane, instructor at butter worker, by F. B. Fulmer; E. H. Hageman and F. Walker, instructors at separators, by L. P. Biddick and J. A. Robinson; and J. E. Knott and F. Wismer, instructors in cheese making, by Julius Bird and John Kelty.

EXPERIMENT STATION RECORD.

VOL. VI. No. 10.

Efforts are continually being made in certain parts of Europe to discredit American clover seed. During the last two or three years, on account of the drought in Europe during the summers of 1893 and 1894, the importation of American seed greatly increased and an outcry was made to beware of such seed on account of insect larvæ, weed seeds, and general worthlessness. Some of the statements published seem to be inspired, not so much from a desire to protect consumers from real danger, as to bring the products of this country into disfavor.

The danger of introducing insect pests is very remote, and the purity and vitality of American clover seed will compare favorably with that grown in any part of the world. A prominent exporter has recently said that clover seed is sold abroad almost entirely by sample and that qualities are furnished to suit the intelligence and conscience of the buyers, hence the responsibility of placing a low grade of seed on foreign markets rests upon the importer. American dealers send their seed to the Federal Seed-Control Station at Zurich, Switzerland, for certification, and it ranks with that of any country in purity, vitality, and intrinsic worth. That weed seeds are found in American clover seed is not to be denied, but the same is true of European seed. Two lots of white and yellow clover seed, varieties little grown for seed in this country, reported upon in a recent Austrian report, contained 19 and 21.6 per cent of foreign seeds, a considerable proportion of which was clover dodder, a plant more injurious to clover than all the native weeds found in our clover fields.

In an article published in a reputable German agricultural journal, a list is given of 50 species of weed seed said to have been found in American clover seed. Thirty of the species enumerated are of European origin and 9 are not specifically determined, leaving but 11 species of certain American origin. The same author attempts to determine the part of the United States in which the clover seed grew from the accompanying weed seed. In making the city from which the seed was exported stand for the group of States adjacent to it he shows ignorance of the trade conditions of this country. He claims that seed of *Phacelia tanacetifolia* was found in considerable quantity in clover seed received from Baltimore, and that this seed is characteristic of the Atlantic group of States when in reality the plant is a Pacific Coast form.

In a later article he has determined a lot of seed as belonging to some member of the order *Tiliaceæ*, but from the description and figures given it is plainly not the seed of *Tilia*, and the only other genera in this country of this order, *Corchorus* and *Triumfetta*, are not grown in the regions producing clover seed. He insisted for a time that seed of *Rumex acetosa*, a pernicious European weed, were to be found in nearly all American-grown seed. Fortunately for us he was mistaken in the determination, as this weed has but a limited distribution in this country. Other of his determinations are doubtful.

That foreign seed is not above suspicion may be seen from reports of the various European seed-control stations, where it is shown that seed of high quality has been mixed with old seed which has been colored or with finely crushed colored quartz. American ingenuity has devised machines for cleaning seed that are said to be superior to any others, and importers can readily obtain American clover seed of good quality if they desire to do so.

By a recent order of the Secretary of Agriculture a dairy division is to be organized in the Bureau of Animal Industry for the purpose of collecting and disseminating information relating to the dairy industry of the United States. Maj. Henry E. Alvord, formerly president of the Maryland Agricultural College, who is widely known for the prominent part he has taken in promoting the interests of agricultural education and investigation in this country, and who has a high reputation as an expert in dairy matters, has been appointed chief of the new division.

THE PHYSICAL PROPERTIES OF THE SOIL.[1]

DR. EWALD WOLLNY.

PART 2.

III.—THE BEHAVIOR OF THE SOIL TOWARD WATER.

The moisture of the soil comes partly from atmospheric precipitation, partly from ground water. With a given amount of water the degree of saturation of a soil may vary widely, depending upon (1) physical condition, (2) depth, (3) position, (4) covering of the soil, and (5) course of the meteorological elements.

INFLUENCE OF THE PHYSICAL CONDITION OF THE SOIL.

In this connection we must consider the various causes which bring about the numerous complicated processes in the soil.

Conduction of water in the soil.—If we suppose the soil to possess a separate grain structure, the spaces between the grains may be regarded in their continuity as tubes, which possess capillary properties if the particles are sufficiently small. The capillarity ceases when the diameter of the particles is more than 2 mm., and varies with smaller particles than these to a greater or less extent according to the fineness of the grains.

With regard to the height to which water can be lifted from a lower layer, and to the velocity with which this occurs, there is the general law that water will be lifted the higher and the more slowly the finer the soil particles and the richer the soil in colloid ingredients. Different soils vary widely in this respect. Capillary height for clay often exceeds 2 meters, but for sand of medium fineness it is generally less than 0.4 meter. While, however, the maximum height is soon reached in sands, the rise in clays is very slow.

Similar behavior is observed in the conduction of water supplied from above. The percolation of water through the soil meets with a certain amount of resistance, due partly to capillarity, partly to adhesion and friction between the water and the soil particles, all of which increase with the fineness of the grains and the quantity of the colloid substances present. Hence the depth and velocity of the percolation are inversely proportional to the size of the grains and the richness of the soil in colloid substances.

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[1] Continued from p. 774.

The large spaces occurring in tilled soils retard the capillary rise of water, but, on the other hand, increase the velocity with which water penetrates downward from the surface, often to a remarkable degree. If crumbly soils are pressed together (rolled), the upward movement of water is increased in proportion to the increase in density, but the percolation of atmospheric water is retarded. The presence of stones diminishes the capillary rise of water in the soil in proportion to the quantity of stones present, and the same is true of the percolation of water.

In soils which are made up of layers of different physical constitution the passage of water from one layer to another, either upward or downward, is hindered more and stopped sooner the wider the difference between adjacent layers in the fineness of their particles or in their other physical properties. Water rises or sinks from a coarse-grained to a fine-grained layer much more readily than the reverse.

The capillary movement of water in a soil occurs only when considerable water is present. It ceases when the soil contains 30 to 50 per cent (according to the fineness of the particles) of the quantity of water required for saturation, and instead there is a very much slower movement of water from the surface of one particle to that of another. If the water envelopes are diminished beyond a certain limit the movement of water ceases altogether.

Capillary rise and percolation of water in the soil declines as the water content of the soil diminishes, because the so-called surface tension of the liquid increases at the same time.[1]

The water-holding capacity of the soil.—The quantities of water in soils are best expressed in percentages of the volume of the soil occupied by water. The old method of expressing the water in percentages by weight is misleading on account of the variations in the specific gravity of soils.[2]

After movement ceases water is retained in the soil by surface attraction and also by the affinity of the colloid substances for water. Other things being equal, the quantity of water stored up by the soil is greater the finer the soil particles and the greater the quantity of colloid material present.

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[1] Meister, Programm des Jahresberichtes 1857–'58 der k. landwirthschaftlichen Centralschule Weihenstephan. W. Schumacher, Physik des Bodens, 1894, p. 91. F. Haberlandt, Wissenschaftlich-praktische Untersuchungen auf dem Gebiete des Pflanzenbaues, 1, 1875, p. 9. A. Schleh, Ueber die Bedeutung des Wassers in den Pflanzen und die Regulirung desselben in unserer Culturböden, Inaugural-Dissertation, Leipzig, 1876. A. von Liebenberg, Ueber das Verhalten des Wassers im Boden, Inaugural-Dissertation, Halle, 1873. H. von Klenze, Landw. Jahrb., 1877, p. 83. A. Mayer, Lehrbuch der Agriculturchemie, II. W. Edler, Die capillare Leitung des Wassers in den durch den Schöne'schen Schlämmapparat abgeschiedenen hydraulischen Werthen, Inaugural-Dissertation, Göttingen, 1882. A. Mayer, Forsch. Geb. agr. Phys., 14, p. 254. E. Wollny, Ibid., 7, p. 269, and 8, p. 206.

[2] A. Mayer, Landw. Jahrb., 1874, p. 753.

On examining a moist column of soil, in which movement of water has ceased, it is found that the quantity of water increases on descending, and that above a certain height the quantity of water remains constant. The reason of this is that in the upper part the water is held only by surface attraction and the capillarity of the very fine interstices, while the water flows out of the larger spaces. In descending the column increasing amounts of water are held even by the larger interstices until finally if the particles are sufficiently fine the water is held even in the largest interstices and the soil is saturated. For this reason we distinguish between an absolute or minimum water capacity, representing the quantity of water held in the upper part of a sufficiently high column of soil by adhesion and in the finest capillaries, and a complete or maximum saturation, representing the quantity of water held by the soil when all the intergranular spaces are filled.[1]

The variations in maximum capacity for water in different soils, with the exception of extremely coarse samples, are comparatively small, because the spaces are approximately equal. (Compare p. 764.) On the other hand, the volume per cent of water corresponding to the minimum water capacity is remarkably variable in natural soils, and generally shows a considerable difference from the maximum capacity. The values for the two kinds of water capacity approximate only in soils which have very small particles and are rich in clay and humus. From these facts it will be seen that the maximum is of much less interest than the minimum water capacity in forming a judgment of a soil.

The minimum water capacity increases, other conditions being equal, with the fineness of the soil particles and the proportion of colloid substances present. It is diminished considerably by the formation of aggregates and increased by compressing the soil. Stones diminish the water capacity. With an increase of temperature the water capacity diminishes owing to the decrease in the viscosity of the water. Repeated freezing and thawing of the mass cause changes in the mechanical structure of clay soils which result in a lowering of the water capacity.[2]

Permeability of the soil for water.—This is very closely connected with the properties already described. It is this property of soils therefore which prevents their supersaturation.

Other things being equal, the quantity of water which filters through a soil may be considered a measure of its permeability. Experiments on this property have shown that the permeability of the soil for water increases with an increase in the size of the grains and a decrease of the quantity of colloid substances present. Clay, humus, and very fine sand, and concretions formed by precipitation (carbonate of lime, hydrated oxid of iron) or adhesion of particles (hardpan) are almost completely impervious to water. The high permeability of coarse soils may be considerably diminished by an admixture of fine-grained material. In stratified soils the permeability is controlled by that layer which is made up of the finest particles, even when the layer is thin. In crumbly soils the permeability is considerably greater than in powdery soils, and it decreases in loose soils when they are pressed together.

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[1] A. Mayer, Landw. Jahrb., 1874, p. 753.

[2] G. Schübler, Grundsätze der Agriculturchemie, 2, 1838. C. Trommer, Die Bodenkunde, 1857. Meister, l. c. W. Schumacher, l. c., p. 86. A. von Liebenberg, l. c. F. Haberlandt, l. c., 1, p. 9. A. Mayer, Fühling's landw. Ztg., 1875, p. 18. H. von Klenze, l. c., p. 122. E. Wollny, Forsch. Geb. agr. Phys., 8, p. 177.

The quantity of water passing through the soil increases with the water pressure—not in the same proportion, but to a less degree. However, the differences in the quantity of water for a given material and thickness of layer corresponding to equal intervals of pressure are constant. Experiments have shown, further, that in fine-grained soils and at high pressures the quantity of water passing through the soil diminishes as the thickness of the layer increases; while in other soils and under lower pressures the relation of the quantity of water to the thickness of the layer is not as great, diminishing as the size of the grains increases.[1]

The power of evaporation of the soil.—This is most conveniently measured by the quantity of water given off by evaporation to the atmosphere from the unit of surface. The method of referring the evaporation to the weight of the soil is subject to the same objections urged against the determination of the water capacity according to the weight of the soil.

The quantity of water evaporated, where only the physical structure of the soil is considered, depends on (1) extent to which the factors determining evaporation (temperature, moisture, and movement of the air) exert their influence, and (2) the power of the lower layers of soil to supply the loss at the surface.

Evaporation increases with the extent of surface. Therefore the quantities of water given up to the atmosphere are greater from uneven and rough than from smooth surfaces. Evaporation is greatest from a southern exposure, next greatest from an eastern, next from a western, and least from a northern exposure. The quantity of water evaporated increases on a southerly and decreases on a northerly exposure with the inclination. For easterly and westerly exposures the influence of inclination on evaporation is hardly perceptible. When very wet, dark soils lose more water by evaporation than light-colored ones, but for dryer soils the reverse is the case.[2]

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[1] E. Wolff, Anleitung zur Untersuchung landw. wichtiger Stoffe, 1875, p. 74. C. Flügge, Ztschr. Biol., 13, p. 465. A. R. von Schwarz, Erster Bericht über Arbeiten der k. k. landw.-chemischen Versuchs-Station in Wien, 1878, p. 51. F. Seelheim, Archives Néerland. Sci. Exact. et Nat., 14, p. 393. D. von Welitschkowsky, Arch. Hyg., 2, p. 499. E. Wollny, Forsch. Geb. agr. Phys., 14, p. 1.

[2] C. Eser, Forsch. Geb. agr. Phys., 7, pp. 46, 47, 53, 97.

The influence of the physical structure of the soil on the evaporation is readily understood if the processes taking place are closely examined. If the water present at the surface of a wet soil passes into the atmosphere in the form of vapor, the pores near the surface are gradually emptied and the water in the next layer forced toward the surface. When this process is communicated to the layers farther down, an upward movement of water by capillarity occurs in the whole mass. In consequence of this process the quantity of water present in the soil diminishes until capillary movement ceases. From this point the water lost from the surface is no longer replaced, and the only remaining movement is that of water from particle to particle on their surfaces, which is very slow. In consequence, the surface of the soil dries up. The uppermost dry layer now hinders the direct influence of the agencies of evaporation, especially that of the wind. Evaporation, therefore, decreases rapidly after the upper layers dry up, and the resistance increases as the drying proceeds downward.

From the above it will be seen that the evaporation steadily decreases under long continued dryness, and further, that the more easily the evaporated water is replaced the more rapid is evaporation and the slower a dry layer is formed, and *vice versa.* It is clear that saturated (wet) soils, irrespective of their mechanical constitution, allow approximately equal quantities of water to evaporate, and that the rate of evaporation, other things being equal, rises and falls with the humidity of the soil. Hence the evaporation capacity of a soil is intimately connected with its water capacity, and is greater in proportion to the fineness of the soil and to its richness in colloid substances, and *vice versa.*

In crumbly soils the evaporation is less rapid than in soils of separate grain structure because in the former case the noncapillary spaces retard the rise of water. Stones act in the same way. An increase in density increases the capillarity, and consequently the evaporation.

In soils of different depths evaporation increases with the height of the soil column up to a certain limit and then diminishes again in proportion to the increase in height. If there is water underneath the soil the evaporation decreases as the distance between the surface of this water and that of the soil increases and as the capillary rise diminishes.[1]

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[1] G. Schübler, l. c. Meister, l. c. F. E. Schulze, Beobachtungen über Verdünstung, Rostock, 1860. E. Wolff, l. c., p. 61. W. Schümacher, l. c. and "Der Ackerbau," 1864, p. 62. J. Nessler, Landw. Correspondenzblatt für das Grossherzogthum Baden, 1860, p. 217. H. Hellriegel, Beiträge zu den naturwissenschaftlichen Grundlagen des Ackerbaues, Brunswick, 1863, p. 625. P. Wagner, Berichte über Arbeiten der Versuchs station Darmstadt, 1874, p. 87. A. Schleh, Inaugural Dissertation, Leipsic. F. Haberlandt, l. c., 2. S. W. Johnson, Rpt. Connecticut Agl. Expt. Sta. for 1877, p. 76. F. Masure, Ann. Agron., 8, p. 161. R. Heinrich, Grundlagen der Beurtheilung der Ackerkrume, 1882. E. Wollny, Forsch. Geb. agr. Phys., 3, pp. 117, 325, 328; 4, p. 360; 5, pp. 21, 157; Landw. Jahrb., 1876, p. 457. C. Eser, Forsch. Geb. agr. Phys., 7, p. 1.

The quantity of water present in the soil at any time is due to the combined action of the factors described as affecting the humidity of the soil, as well as to other influences. In general, the average quantity of water in natural soils is greater in proportion to the fineness of the particles and the quantity of clay and humus present. Of the different soil constituents humus holds as a rule the largest quantity of water, then follow in order clay, loam, and quartz. Soils having a separate grain structure show a much higher average humidity than crumbly soils. Stones diminish the percentage by volume of water in proportion to their quantity. With an increase in density we generally find a rise in humidity, other things being equal.

As may be seen, the variations of humidity in natural soils correspond in general to those of water capacity, because as a rule evaporation and permeability practically equalize each other, for generally a high evaporation is associated with a correspondingly low permeability, and *vice versa*. Nevertheless, these factors, especially evaporation, can under certain circumstances weaken or completely nullify the influence of the others. For instance, the values for the average humidity of soils of varying compactness are more nearly the same than those found for the water capacity under the same circumstances, because with the increase in density the evaporation increases, involving a more rapid loss of the stored up water.[1] That evaporation is in many cases the most important factor influencing the humidity of the soil is shown by the fact that a soil of uneven surface and dark color contains less water than one of smooth surface and light color.[2] The stirring of the upper layer of soil at first increases the evaporation, but after a short time the loosened layer dries out and serves to prevent evaporation from the lower layers by diminishing the direct influence of the agencies of evaporation on the soil and by retarding the capillary rise of water to the surface.[3]

Variations in the humidity of the upper parts of the soil are caused by the accumulation of water in an impermeable layer in the subsoil. If this impermeable layer is near the surface, the water may come quite to the top of a level soil, in which case the soil is saturated. If the ground water is farther beneath the surface the influence on the humidity of the upper layers depends entirely on the conductivity of the layers. The higher the water rises by capillarity the greater the influence of the ground water on the humidity of the upper layers.

INFLUENCE OF THE DEPTH OF THE SOIL.

Experiments on this subject[4] have shown that the absolute humidity of the soil always increases with the thickness of the soil layer, and that the percentage by volume behaves in the same way up to a certain limit, above which it does not change with an increase in the depth of the soil. This limit varies considerably in different soils. It lies at that point where the capillary rise of water from the lower moist layers of the soil toward the surface ceases. It increases, therefore, with the ability of the soil to conduct water by capillarity, and *vice versa*. Variations in the humidity increase as the thickness of the soil diminishes.

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[1] E. Wollny, Forsch. Geb. agr. Phys., 5, pp. 1, 145.

[2] Ibid., 3, p. 117; 12, p. 386.

[3] Ibid., 3, p. 325.

[4] Ibid., 16, p. 1.

INFLUENCE OF THE POSITION OF THE SOIL.

Inclination.—A level soil is, as a rule, moister than an inclined soil. If inclined, the moisture decreases with an increase in inclination. In the case of inclined soils the difference in moisture in the higher and lower parts of the soil increases with inclination.

Exposure.—In soils having different exposures, those facing the north have most moisture, then those toward the west, then the east, while those facing the south are driest. These differences increase with the angle of exposure.[1]

INFLUENCE OF THE COVERING OF THE SOIL.

The moisture content of a soil covered with plants during the period of growth is always lower, under like conditions, than one left bare. This is due to the rapid transpiration of water by living plants. This drying up of the soil, which is also noticed in timber lands, is greater in proportion to the development of the plants, the thickness of the stand, and the length of the period of growth. The influence on the humidity of the soil diminishes as the plants die off on approaching maturity, and is greatest when development of the aërial organs is greatest.

A covering of dead plants, straw, stable manure, etc., or of such materials as stones, gravel, wood, etc., increases the moisture of a soil during the warm seasons, because such a covering affords protection against evaporation. In general the moisture of the soil increases with the thickness of such a covering.

We see, then, that as a rule soils shaded by growing plants contain least moisture, soils covered with stones and other lifeless materials contain most, while those that are bare stand intermediate.[2]

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[1] E. Wollny, Forsch. Geb. agr. Phys., 9, p. 3; 10, p. 3.

[2] G. Wilhelm, Der Boden und das Wasser, Vienna, 1861; Wochenbl. für Forst- und Landw. in Württemberg, 1866, p. 174; Landw. und forst. Ztg., 1867, p. 31; Fühling's landw. Ztg., 1876, p. 40; Wiener landw. Ztg., 1874, p. 159. E. Risler, Chemischer Ackersmann, 1870, p. 131. W. Schumacher, Fühling's landw. Ztg., 1872, p. 604; 1873, p. 683. A. Vogel, Abhandl. der k. bayerischen Akad. der Wissenschaften, II. Classe, vol. 10, part II, 1867. J. N. Woldrich, Ztschr. österr. Ges. Meteorol., 6, No. 8. E. Ebermayer, Die physikalischen Einwirkungen des Waldes auf Luft und Boden, Berlin, 1873; Forsch. Geb. agr. Phys., 12, p. 147. E. Wollny, Der Einfluss der Pflanzendecke und der Beschattung auf die physikalischen Eigenschaften und die Fruchtbarkeit des Bodens, Berlin, 1877; Forsch. Geb. agr. Phys., 10, pp. 261, 415; 12, p. 21; 13, p. 134; 14, p. 138; 17, p. 171. R. Lorenz von Liburnau, Wald, Klima und Wasser, 1878. E. Ramann, Die Waldstreu, 1890; Forsch. Geb. agr. Phys., 11, p. 299; Forstliche Bodenkunde, 1893, p. 255.

This can not be disregarded if we wish to obtain a clear insight into the cause of the widely varying condition of moisture of soils under natural conditions, because the physical properties of the soil itself are influenced by the average course of the elements (climate) and their behavior at different times (weather).

The effects of climate may be thus generally stated: A higher degree of moisture in the soil accompanies copious precipitation, greater humidity of the atmosphere, moderate movement of the air, lower temperature and greater water capacity of the soil, while a drier condition of the soil is caused by the reverse circumstances. For a particular case the effects can only be understood by knowing the course of the individual elements and the constitution of the soil.

The relation of the weather to the humidity of the soil is many sided.

Although the quantity of precipitation in the countries of middle Europe is smaller during the cold season than during the warmer parts of the year, the wetting of the soil is very much more complete in the former than in the latter case on account of the diminished evaporation due to a lower temperature. This is particularly true of soils covered with plants, because the latter, as a rule, use up the water obtained by the soil from the atmosphere during the period of growth, and sometimes a part of the water stored up during the cold season also.[1] From these facts it follows that the water collected in the soil during the period of no growth (winter moisture) may, under certain circumstances, be very important for vegetation.[2]

In the dry season the influence of evaporation is as a rule predominant. In long periods of dryness evaporation may cause an equalizing of humidity in soils of different physical constitution, independently of how high the moisture was originally.[3] The differences in humidity between covered and bare soils show themselves more strongly, however, under such circumstances. This is also true for uneven, dark-colored soils, compared with smooth light-colored soils.[4]

Winds influence evaporation to a remarkable degree, and therefore exert a great influence on the humidity of the soil. The evaporation varies with the velocity of the wind. In the case of westerly and northerly winds, which are moist as a rule, the evaporation is less than in the case of easterly and southerly winds, which are generally dry.[1] [This, of course, is not universally true.—ED.]

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[1] E. Wollny, Der Einfluss der Pflanzendecke und der Beschattung auf die physikalischen Eigenschaften und die Fruchtbarkeit des Bodens, Berlin, 1877, p. 119; Forsch. Geb. agr. Phys., 4, p. 85. F. von Höhnel, Mitt. aus dem forst. Versuch. Oesterr., 1879; Forsch. Geb. agr. Phys., 4, p. 435.

[2] G. Havenstein, Landw. Jahrb., 7.

[3] C. Eser, Forsch. Geb. agr. Phys., 7, p. 1.

[4] E. Wollny, Der Einfluss der Pflanzendecke und der Beschattung auf die physikalischen Eigenschaften und die Fruchtbarkeit des Bodens; Forsch. Geb. agr. Phys., 3, p. 147; 12, p. 386.

During the rainy period the precipitation serves first to replace the water evaporated during the preceding period—that is, to remoisten the soil. The saturation of the soil takes place in different ways according to the conductivity and water capacity of the soil. Fine grained soils which conduct water slowly are only moistened to a slight depth, and in consequence of this the water accumulates to a greater or less extent on the surface in the case of level land, or flows away if the ground is sloping. Soils of this kind store up during a copious precipitation of long duration more water than corresponds to their water capacity, because the water percolates slowly. The greater the permeability of the soil the easier the water sinks and the thicker the layer of soil which is moistened. A high degree of permeability, therefore, lessens the storage of water, since more or less of the rainfall passes down into the depths of the soil. Soils of this kind are most uniformly moistened when there is at each precipitation not more water than the soil can retain. From this we see the importance of greater frequency of precipitation for such soils. The need of frequent precipitation decreases as the water capacity increases and permeability decreases, because the water supplied to the soil is stored up to a greater or less extent. In extreme cases—that is, with difficultly permeable soils—a less frequent but more copious supply of water must be regarded as more advantageous.[2]

In as far as the humidity depends on the texture of the soil, the quantity of water stored up during the wet season corresponds almost exactly to the water capacity of the soil. When, on the other hand, the differences in soil moisture are caused by those in evaporation, precipitation may cause an equalization of the quantities of water stored up. Therefore the variation in soil moisture due to difference in character (evenness, color) of the surface, or to difference in covering, exposure, and inclination, may during long rainy periods or the colder seasons become more or less completely equalized.

From the fact that the atmospheric precipitation serves first to replace the water lost by evaporation during a period of dryness, and that an excess sinks down or collects only when the soil is saturated, we must infer that the quantity of percolating water and the height of the ground water can not be ascertained from the permeability of the soil or quantity of precipitation alone. The general facts in this connection are summarized below.

THE QUANTITIES OF PERCOLATING WATER.

In soils destitute of plant life the quantity of percolating water varies with the atmospheric supply, but in a ratio which depends on the physical structure of the soil, character of its surface, distribution of the precipitation, and the season. The greater the evaporation and the water capacity and the less the permeability of the soil, the smaller is the quantity of percolating water, other things being equal. For these reasons percolation diminishes in proportion to the increase of fine particles (clay and humus) in the soil or to the decrease of large noncapillary spaces, and *vice versa.* The downward flow of water increases with the thickness of the soil layer up to a certain limit (about 60 cm.), above which an increase in thickness is without influence on percolation. In the case of light-colored, loose, and even surfaces the percolation is greater than in dark-colored, compact, and uneven surfaces. The covering of a soil with lifeless material (dead plants, stones, coarse-grained soils) causes a considerable increase, while a covering of living plants causes a remarkable decrease in the amount of percolating water. The influence of the distribution of precipitation on the absolute quantity of water carried off from beneath the surface is shown in the fact that the largest quantities of percolating water in bare soils occur in seasons of greatest precipitation. Those districts where the soil freezes and becomes impermeable in winter form an exception to this rule. In such cases drainage is generally suspended until the spring. With regard to the ratio of the water percolating through the soil to the quantity of precipitation, it is generally true that relatively the larger proportion of the water supplied is carried away by drainage when the season is coldest. In soils covered with living plants the quantities of percolating water do not follow the course of precipitation, but are greatly reduced by transpiration by plants. For these reasons the greatest percolation occurs in all cultivated regions irrespective of the distribution of moisture in the cold season of no growth, in winter or in spring, according to the predominance of warmth.[1]

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[1] J. A. Henselc, Forsch. Geb. agr. Phys., 16, p. 311.

[2] E. Wollny, Forsch. Geb. agr. Phys., 14, p. 138. Compare also p. 853.

THE HEIGHT OF THE GROUND WATER.

Variations in the height of the ground water depend partly upon the physical structure of the soil, partly upon the quantity and distribution of precipitation. In horizontal strata the height of the ground water depends upon the depth of the impermeable subsoil, and approaches nearer to the surface of the soil in proportion to the coarseness of the soil and its poorness in clayey and humus materials. In periods of drought the variations in the level of the surface of the ground water increase with the thinness of the permeable layer in which the water occurs, and with the ease with which the water is raised by capillarity. In bare soils and in those covered with lifeless materials the ground water rises and falls with the quantity of precipitation so long as the water table does not reach the surface. In soils covered with living plants no ground water collects during the period of growth even when the soil is very deep (1.2 meters or more), or at least only temporarily.[1]

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[1] J. Dalton, Mem. Lit. Phil. Soc. Manchester, 5, part II. J. Dickenson, Jour. Roy. Agr. Soc., 5. Maurice, Bibl. univ. Genève, Sci. et Arts, 1. Gasparin, Cours d'Agriculture, 2, p. 116. G. von Möllendorff, Die Regenverhältnisse Deutschlands, 1862. E. Risler, Arch. des Sci. de la Bibl. univ., 1869. F. Pfaff, Sitzungsber. könig̣. bayer. Akad. Wissensch., 1 (1868), p. 311; 2 (1869), p. 125. J. N. Woldrich, Ztschr. österr. Ges. für Meteorol., 6, p. 97. J. H. Gilbert, Proc. Inst. Civil Engineers, 45, part III; 105, part III. E. Ebermayer, Die physikalischen Einwirkungen des Waldes auf Luft und Boden, Berlin, 1873, p. 215; Forsch. Geb. agr. Phys., 12, p. 147; 13, p. 1. E. Wollny, Der Einfluss der Pflanzendecke und der Beschattung auf die physikalischen Eigenschaften und die Fruchtbarkeit des Bodens, Berlin, 1877, p. 137; Forsch. Geb. agr. Phys., 10, pp. 1, 321; 17, p. 180.

THE DISTRIBUTION OF WATER IN THE SOIL.

From what has been already said it is readily understood that the moisture, as a rule, increases with the depth. This is true of all soils as long as there is no precipitation and no downward movement of water. In case of a soil of low permeability or one covered with strongly transpiring plants a thorough moistening of the upper layers occurs only when atmospheric moisture is supplied. Under these circumstances more water is contained in the upper layer temporarily than in the lower strata, and a dry layer may occur between the upper and lower moist layers if the rain is not sufficient for complete saturation—an occurrence observed quite frequently in soils covered with plants during the summer.

According to Hofmann[2] we may conveniently distinguish three soil layers. First there is a superficial zone of evaporation, in which the degree of moisture varies from complete saturation to great dryness. In this zone in case of a dry, hot summer the whole of the summer and late autumn precipitation may often be absorbed without filling up the capillary pores down to the lower limit of the zone. In such cases an intermediate dry layer always exists between the upper layer, temporarily moistened by precipitation, and the deeper water-conducting layer. Below this superficial zone, then, there lies the so-called transition zone, which is that part which is never dried up, but which always has its capillary pores filled with water. If this second zone receives water from above after the superficial layer has been completely saturated with water it does not retain it, but allows the excess to sink into the third zone—that of the ground water.

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[1] Hofmann, Arch. Hyg., 1. J. Soyka, Der Boden. Pettenkofer and Ziemssen, Handbuch der Hygiene, 1887, p. 251; Die Schwankungen des Grundwassers. A. Penck, Geographische Abhandlungen, 1888, 2, No. 3. E. Wollny, Forsch. Geb. agr. Phys., 14, p. 332.

[2] Arch Hyg., 1 and 2, No. 2.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

The estimation of nitrogen in feeding stuffs by the Kjeldahl method, GERLACH and SÜVERN (*Chem. Ztg., 18 (1894), No. 97, pp. 1902, 1903*).—A number of determinations of nitrogen by the Kjeldahl method in cotton-seed meal, rice meal, and peanut meal showed that varying the time of digestion from 2 to 12 hours caused an increase of scarcely 0.1 per cent. The use of concentrated sulphuric acid containing 150 gm. of phosphoric anhydrid to the liter secured practically the same results. The average of a number of blank determinations showed that about 0.03 per cent of nitrogen was obtained from the air in the digestion flask after 12 hours' digestion. The authors therefore conclude that the use of phosphoric anhydrid is unnecessary, and that a digestion of from 2 to 3 hours is sufficient. The small additional amount of nitrogen obtained after a long digestion is doubtless from some compound other than albuminoids and would play a small part in the economic value of the feeding stuffs.—J. P. STREET.

Note on the Kjeldahl method for nitrogen, O. KELLNER, O. BÖTTCHER, and G. DIESSELHORST (*Chem. Ztg., 19 (1895), No. 3, p. 35*).—An answer to the above article of Gerlach and Süvern, showing that the total nitrogen can not be obtained from products like cotton-seed meal by digesting from 2 to 3 hours unless the sulphuric acid contains phosphoric anhydrid and metallic mercury is added.—J. P. STREET.

On the preparation of ammonium citrate solution, R. DE ROODE (*Jour. Amer. Chem. Soc., 17 (1895), No. 1, p. 47*).—If in making the citrate solution it is made decidedly alkaline with ammonia and allowed to stand over night, in the morning the solution will be found to be strictly neutral. The addition of a small quantity of salicylic acid (1 gm. to 5 liters) before neutralizing will prevent the growth of fungus in the solution.—J. P. STREET.

Some facts observed in the determination of phosphoric acid by the molybdic acid process, R. DE ROODE (*Jour. Amer. Chem. Soc., 17 (1895), No. 1, pp. 43–46*).—Experiments are briefly reported from which the author draws the following conclusions:

"(1) Our present method [official] for determining phosphoric acid seems to give results which are somewhat too high.

"(2) The results obtained by using a large quantity of substance, and obtaining large precipitates, are lower and somewhat more accurate than those obtained where smaller quantities are employed.

"(3) Somewhat lower and more accurate results are obtained by using a blank made by employing a dilute solution of a phosphate, which is added to each determination. This blank, previously determined, being substracted from the final result.

"(4) Accurate results, agreeing with those obtained by the use of the blank, are obtained by redissolving the magnesium pyrophosphate and reprecipitating.

"(5) Five minutes' digestion at 65° C. seems to be sufficient for the complete precipitation of phosphoric acid by molybdic solution."—R. H. LOUGHRIDGE.

The determination of phosphoric acid, H. PEMBERTON, Jr. (*Jour. Amer. Chem. Soc., 17* (*1895*), *No. 3, pp. 178–181*).—The author calls attention to several points in his method (E. S. R., 5, p. 444). In preparing the standard alkali the indicator used should be phenolphthalein and not methyl orange, as the latter is affected by the alumina usually contained in potassium hydroxid. In heating the solution it should be brought to a full boil. It will then take care of itself and does not need any definite temperature for proper precipitation. In precipitating, the aqueous molybdate should be added slowly, stirring frequently, thus obtaining a purer precipitate.—J. P. STREET.

The determination of potash in manures, W. E. GARRIGUES (*Jour. Amer. Chem. Soc., 17* (*1895*), *No. 1, pp. 47–51*).—Work 10 gm. of the sample into a paste with concentrated sulphuric acid in a platinum dish. Ignite, raising the heat gradually until the residue is white, or red if iron be present. Grind the residue in a mortar to a fine powder, add a little hot water, and triturate the mass for a few minutes. Wash into a 500 cc. flask and boil with 250 cc. of water for 30 minutes, and then run in a 10 per cent solution of barium chlorid, 5 cc. at a time, boiling after each addition, until no further precipitation is visible. Add sodium carbonate until a faint permanent rose color is obtained with phenolphthalein. Boil for a minute, cool, and fill to the mark. Filter, add hydrochloric acid in slight excess to 50 cc. in a porcelain dish, and evaporate on a water bath with platinic chlorid. Wash the precipitate with alcohol (sp. gr. 0.848), dry at 100° C., and weigh. For potash salts, the ignition with sulphuric acid is omitted.

The sulphuric acid must be added cautiously to prevent loss from the violent reaction, when chlorids and nitrates are present. The ignited mass must be pulverized very finely, to prevent the occlusion of potash by the calcium sulphate. An excess of sodium carbonate must be avoided, as double decomposition may take place.

While the method does not, in common with those now in use, return quite all the potash, it is claimed that it is no less accurate, and gives less discordant results than the Lindo-Gladding, besides being more satisfactory to work and quicker. One filtration and evaporation only are entailed, but a greater quantity of platinic chlorid is required.—J. P. STREET.

The addition of calcium chlorid to the solution of a fertilizer in the determination of potash, R. DE ROODE (*Jour. Amer. Chem. Soc., 17* (*1895*), *No. 1, p. 46*).—Experiments made by the author indicate that in the presence of ammonia and some ammonium oxalate or carbonate the addition of calcium chlorid does not result in the formation of tricalcium phosphate in the solution prepared as directed in the official methods, and hence "the very object for which the calcium chlorid is added is defeated."

The determination of woody fiber in fodders, A. P. AITKEN (*Analyst, 20 (1895), Feb., pp. 35–37*).—The author follows the conventional method of digesting with 1¼ per cent acid and alkali, but overcomes the difficulties of frothing and change of strength by evaporation by abandoning boiling. "I now use beakers, which I immerse in a steam bath and which I cover with watch glasses. The result is that the solutions are maintained at the temperature of boiling water and no evaporation takes place, so that the strength of the solution does not alter and the subsequent washing of the residues and their final removal from the beaker to a filter or Gooch crucible is easy. The extraction of the soluble matters is not so rapid, . . . but three quarters of an hour in the steam bath is equivalent to half an hour's boiling." The conditions being more uniform, successive determinations "give results of great uniformity."

Extraction of the fat was mentioned as advisable in the case of oil cakes. In the discussion following the paper Mr. Dyer regarded incomplete extraction of the oil, either before or after treatment with acid or alkali, as a frequent source of error. Mere alkaline treatment failed to saponify more than a fraction, sometimes only a moderate fraction, of the oil.

Quick estimation of starch, P. L. HIBBARD (*Jour. Amer. Chem. Soc., 17 (1895), No. 1, pp. 61–68*).—Place enough of the finely pulverized material to contain at least 0.5 gm. of starch in a flask with about 50 cc. of water, and add 1 or 2 cc. of malt extract. Heat to boiling, shaking frequently to prevent the formation of clots of starch. (The addition of diastase before gelatinizing the starch helps to prevent this, as it acts above the temperature at which the starch becomes pasty.) After boiling a minute, cool to 50 to 60° C., and add 2 to 3 cc. malt extract. Heat slowly from 10 to 15 minutes till boiling, again partially cool, and test with iodin solution. If there is a blue reaction, another addition of malt must be made. When all the starch is changed, cool the mixture, make up to definite volume, and filter through fine linen or muslin. Place an aliquot part of the filtrate, containing 0.2 or 0.3 gm. of starch, in a 100 cc. flask with 5 cc. hydrochloric acid, containing 30 per cent of hydrochloric acid, and water to make about 60 cc. total. Boil for 30 minutes on a sand bath, cool, nearly neutralize with sodium hydroxid, and determine the dextrose by Fehling's solution. The method is said to be simple, rapid, and fairly accurate.—J. P. STREET.

Method of estimating acidity of milk, M. SCHAFFER (*Staz. Sper. Agr. Ital., 26 (1894), pp. 164–167; abs. in Jour. Chem. Soc., 67–68 (1895), Mar., p. 94*).—An apparatus is used consisting of 3 bulbs, 2 holding about 50 cc. each connected by a narrow graduated tube, and the third below holding 2 cc. The upper bulb is stoppered. In making a test 2 cc. of phenolphthalein is placed in the lowest bulb, then 50 cc. of milk, measured on the graduated tube, and 2 to 2.5 cc. one fourth normal soda solution, and mixed, not shaken. Soda is added until alkaline, and the quantity used is read off on the graduated tube connecting the 2 large bulbs.

The relation between specific gravity, fat, and solids-not-fat in milk, H. D. RICHMOND (*Analyst, 20 (1895), Mar., pp. 57, 58*).—A simplification of Richmond's new formula to

$$T = \frac{G}{4} + \frac{6}{5}F + 0.14,$$

in which T=total solids, G=lactometer reading, and F=fat.

"The results will not differ (in extreme cases) more than 0.02 from the other formula." The formula may be further simplified to

$$T = 0.25\ G + 1.25\ F, \text{ or } T = \frac{G+5\ F}{4}$$

"and this second formula is correct within 0.2 per cent up to 6 per cent fat. It is still more accurate if 0.05 per cent be added for each 1 per cent above 3 per cent, and subtracted for each 1 per cent below 3 per cent."

The detection of saccharin in beer, F. GAULTER (*Rev. Internat. Falsif., 8 (1894), p. 47; abs. in Chem. Centbl., 1895, I, No. 3, p. 175*).—The author finds that the resin present in beer produces a fluorescence when treated with resorcin and sulphuric acid, and for this reason holds that Börnstein's reaction is uncertain. To obviate this difficulty he evaporates to a sirup, adds a few drops of hydrochloric acid, extracts with 95 per cent alcohol, evaporates the alcoholic extract to a sirup, extracts with ether, and evaporates to dryness. The residue is then extracted with hot water, and the saccharin obtained from the water as a yellowish crystalline substance.—W. D. BIGELOW.

Notes on the estimation of iron and alumina in phosphates, K. P. MCELROY (*Jour. Amer. Chem. Soc., 17 (1895), No. 4, pp. 260–263*).

Contribution on the estimation of nitric acid, R. BERGER (*Chem. Ztg., 19 (1895), No. 15, pp. 305, 306*).—A volumetric method based on the same principle as the Schulze-Tiemann. The method has been successfully used in the analysis of saltpeter, and in the determination of the amount of nitric acid in sulphuric acid.—J. P. STREET.

The determination of potash in kainit, R. DE ROODE (*Jour. Amer. Chem. Soc., 17 (1895), No. 2, p. 85*).—The evaporation of "an aliquot portion of a filtered aqueous solution of kainit directly with platinum chlorid" is claimed to give accurate results.

The oxidation of organic matter and the decomposition of ammonium salts by aqua regia in lieu of ignition, in the determination of potash in fertilizers, R. DE ROODE (*Jour. Amer. Chem. Soc., 17 (1895), No. 2, pp. 86, 87*).—The details of the method have not yet been worked out.

On the determination of cane sugar in the presence of commercial glucose, H. A. WEBER and W. MCPHERSON (*Jour. Amer. Chem. Soc., 17 (1895), No. 4, pp. 312–320*).—This article appeared originally in the Proceedings of the Association of Official Agricultural Chemists for 1894.[1]

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[1] U. S. Dept. Agr., Div. of Chemistry Bul. 43, pp. 126–131.

On the action of acetic and hydrochloric acids on sucrose, H. A. WEBER and W. MCPHERSON (*Jour. Amer. Chem. Soc., 17 (1895), No. 4, pp. 320-327*).—This article appeared originally in the Proceedings of the Association of Official Agricultural Chemists for 1894.[1]

Water determination in raw sugar, GUNNING and ALBERDA (*Sucr. Belge, 23 (1894), p. 108; abs. in Chem. Ztg., 18 (1894), No. 100, Repert., p. 313*).

A new method of estimating glucose by alkaline copper solution, ALLEIN and GAUD (*Jour. Pharm. et. Chim., 30 (1894), pp. 305-307; abs. in Analyst, 20 (1895), Jan., p. 21*).

Concerning the influence of the presence of lead acetate on the results of determinations of invert sugar by the Fehling-Soxhlet method, A. BORNTRÄGER (*Ztschr. angew. Chem., 1895, No. 4, pp. 103, 104*).

Preservation of starch solution, H. KRÁL (*Pharm. Cent. Halle, 15 (1894), p 606; abs. in Analyst, 20 (1895), Jan., p. 23*).

A new method of estimating milk fat, P. FERNANDEZ-KRUG and W. HAMPE (*Ztschr. angew. Chem., 1894, No. 22, pp. 683-687; abs. in Analyst, 20 (1895), Jan., p. 20*).

An easy method for the examination of butter mixed with foreign fats, C. KILLING (*Abs. in Chem. Ztg., 18 (1894), No. 100, Repert., p. 314; and in Milch Ztg., 23 (1894), No. 49, pp. 781, 782*).—The method is based on the determination of the viscosity of butter, for which a special apparatus has been devised, too complex for description here.

The separation of solid and fatty acids, E. TWITCHELL (*Jour. Amer. Chem. Soc., 17 (1895), No. 4, pp. 289-295*).

Contributions to acid-butyrometry according to Gerber, P. HAUSMANN (*Chem. Ztg., 19 (1895), No. 17, pp. 348-350*).—A comprehensive comparison of the methods of Gerber, Babcock, and Thörner for the determination of fat in milk. From a tabulation of the experience of a number of analysts with the 3 methods, the Gerber method appears to be preferable because of its simplicity, ease of manipulation, and cheapness.—J. P. STREET.

Refractometer for the examination of butter (*Pharm. Centbl., 1894, No. 33; abs. in Milch Ztg., 24 (1895), No. 3, pp. 40-42*).—A new refractometer, essentially a simplification of the Abbé instrument, and especially adapted to inspection work.—J. P. STREET.

Polarization-microscope and Zeiss' refractometer for the examination of butter, C. BESANA (*Staz. Sper. Agr. Ital., 26 (1894), p. 601; abs. in Chem. Ztg., 18 (1894), No. 96, Repert., pp. 294, 295*).

The use and value of the butyro-refractometer of Abbé-Zeiss, J. DELAITE (*Abs. in Chem. Ztg., 19 (1895), No. 16, Repert., p. 57*).

The estimation and numerical expression of color in tanning materials, J. G. PARKER and H. R. PROCTOR (*Jour. Soc. Chem. Ind., 14 (1895), No. 2, pp. 124-127*).

Estimation of saccharose in malt, E. JALOWETZ (*Abs. in Chem. Ztg., 18 (1894), No. 96, Repert., p. 294*).

Wine analysis, ROESLER (*Forsch. ü. Lebensmtl., 1 (1894), pp. 347-351; abs. in Chem. Centbl., 1894, II, p. 499*).—The article defines grape wine (Natur- und Vollweine und Halbwein), fruit wine and artificial wine, and gives the characteristics of each, and permitted and prohibited additions before and after fermentation. Methods for the examination of wines are also given.—W. D. BIGELOW.

Detection of salicylic acid in wine, E. CLAASSEN (*Pharm. Rundschau, 13 (1895), No. 2, pp. 38, 39*).

Estimation of phosphoric acid in sweet wine, E. LÁSZLÓ (*Chem. Ztg., 18 (1894), No. 91, p. 1771*).

Proportion of dextrose and levulose in sweet wine and honey, J. KÖNIG and W. KARSCH (*Ztschr. analyt. Chem., 34 (1895), No. 1, pp. 1-18*).

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[1] U. S. Dept. Agr., Div. of Chemistry Bul. 43, pp. 131-135.

Titration with Fehling's solution in wine analysis, A. Bornträger (*Ztschr. analyt. Chem., 34 (1895), No. 1, pp. 19-35*).

Date wine and fig wine, A. Maitre (*Jour. Pharm. et Chim., 1894, ser. 5, No. 30, p. 339; abs. in Chem. Centbl., 1894, II, No. 23, p. 933*).

Estimation of mannite in wine, J. A. Muller (*Bul. Soc. Chim. Paris, 12-13 (1895), No. 22, pp. 1073-1080*).—This article is a continuation of that published by the author in the same journal, 10-11 (1893), p. 333.

Constant level apparatus, J. C. Chorley (*Analyst, 20 (1895), Jan., p. 16, fig. 1*).—This is designed for use in distillations where it is desirable to maintain a constant level in the distilling flask.

Apparatus for preserving and delivering standard solutions, J. C. Chorley (*Analyst, 20 (1895), Jan., p. 15, fig. 1*).

The use of the Mohr-Westphal balance in milk analysis, C. H. Wolff (*Ztschr. angew. Chem., 1895, No. 5, pp. 134-137, figs. 2*).

Examination of pectase and the pectic fermentation, G. Bertrand and A. Mallèvre (*Bul. Soc. Chim. Paris, 12-13 (1895), No. 2, pp. 77-82*).

The alkaloids of Corydalis cava—Corybulbine, J. J. Dobbie and A. Lauder (*Jour. Chem. Soc. London, 67 (1895), Jan., pp. 25-30*).

Concerning the leucin resulting in pancreas digestion, R. Cohn (*Ztschr. physiol. Chem., 20, No. 1 and 2, pp. 203-209*).

Concerning fungus cellulose, E. Winterstein (*Ber. deut. bot. Ges., 13 (1895), No. 2, pp. 65-70*).—A study is given of fungus cellulose prepared by various methods.

Note on fungus cellulose, E. Winterstein (*Ztschr. physiol. Chem., 20, No. 3, p. 342*).

Contributions to the chemistry of cellulose, I, A. L. Stern (*Jour. Chem. Soc. London, 67 (1895), pp. 74-90*).—This first paper is on cellulose sulphuric acid and the products of its hydrolysis.

The carbohydrates of yeast, E. Salkowski (*Ber. deut. chem. Ges., 27 (1895), No. 19, pp. 3325-3328*).

The furfurol-yielding constituents of plants, C. F. Cross, E. J. Bevan, and C. Beadle (*Jour. Amer. Chem. Soc., 17 (1895), No. 4, pp. 286-289*).

The yellow coloring matters of Sophora japonica, E. Schunck (*Jour. Chem. Soc. London, 67 (1895), Jan., pp. 30-32*).

Essential oil of hops, A. C. Chapman (*Jour. Chem. Soc., 67 (1895), Jan., pp. 54-63*).

Theories of the formation of sugar, E. Duclaux (*Ann. Inst. Pasteur, 9 (1895), No. 2, pp. 120-128*).—A critical review.

Variations in the sugar compounds during the germination of barley, P. Petit (*Compt. Rend., 120 (1895), No. 12, pp. 687-689*).

Transformations of fibrin by the prolonged action of dilute saline solutions, A. Dastre (*Compt. Rend., 120 (1895), No. 11, pp. 589-592*).

A compendium of agricultural chemistry (Précis de chimie agricole), E. Gain (*Paris: J. B. Baillière et fils, pp. 436, figs. 93. Reviewed in Ing. Agric. Gembloux, Apr., 1895, p. 475*).—The principal divisions are plant nutrition, composition of plants, fertilization of the soil, and the chemistry of agricultural products.

BOTANY.

The action of the water of the soil on vegetation, E. Gain (*Rev. gén. Bot., 7 (1895), Nos. 73, pp. 15-26; 74, pp. 71-84; 75, pp. 123-138, figs. 2*).—The author reviews his own work and that of other investigators in the following lines: (1) The amount of water in arable soils, (2) physical and chemical action of water on the substances which plants assimilate from the soil, and (3) the biological effects of dryness or humidity of the soil.

It is pointed out, among other things, that the moisture of the soil has a marked influence upon the activity of the microörganisms of the soil which aid in the nutrition of plants, especially the root tubercle bacteria.[1] The author's experiments lead to the conclusion that a medium amount of moisture in the soil (50 per cent of that required for complete saturation) is as a rule more favorable to the development of root tubercles than higher or lower amounts.

The results of experiments relating to the biological effects of dryness and humidity on 6 different kinds of soils indicate that different plants behave in the same manner as regards resistance to drought, but that the amount of moisture destructive to plants varies with the stage of growth. It is possible, therefore, to trace a curve for each species, showing its water requirements at every period of growth.

As regards the influence of the moisture of the soil on absorption and transpiration by plants, experiments indicate that (1) the saturation of a soil previously dry produces marked disturbances in the flow of sap; (2) transpiration varies with the water content of the soil, being greater the higher this content; and (3) when the maximum of turgescence is passed transpiration decreases, there being in fact a maximum of turgescence for each moment of growth at which the functions of nutrition are most active.

The effect of decapitation on plant organs, B. ROTHERT (*Trans. Assn. Naturalists, Imp. Univ. Kazan, 26 (1893), No. 5, p. 77, figs. 2*).—The present investigations were conducted by the author to test the statement of Darwin that the cotyledons of *Phalaris canariensis*, the tops of which had been cut off, did not undergo any heliotropic curving, while those which were uninjured curved rapidly and strongly; from which Darwin concluded that the top of the cotyledon was sensitive to light and that heliotropic curving of the lower part of the cotyledon is caused by irritation transmitted to it from the top, and that the loss of heliotropism was due to removal of the sensitive part of the shoot.

Following the methods of experiment pursued by Darwin the author conducted a series of experiments with etiolated plants of *Phalaris canariensis*, in which he proved that decapitation produces but a temporary disappearance of heliotropic curving.

A second series of experiments was conducted with *Avena sativa* and also *P. canariensis*, in which the action of the two are so nearly alike that they are described together. From 4 to 7 mm. of the tips were cut from the oats, and from the canary grass the portions removed varied from ½ to 7 mm. The experiments proved that the disappearance of heliotropic curving was evidently produced by the wounding of the shoots and is not to be attributed to the removal of the irritating effect when the top is cut. The belief that the disappearance of heliotropic curving might be due to temporary arresting of growth of the rest of the shoots caused the author to conduct a series of experiments in which various zones were marked off on the growing shoots, and the growth of uninjured and decapitated shoots compared. From the experiments it is shown that decapitation always causes considerable decrease of growth. This decrease is most marked in the zone nearest the cut, where in some cases there is no growth shown, but on descending toward the base of the shoot the difference between the growth of the decapitated and sound plants becomes greatly reduced. It was also shown that the decrease in growth was the strongest at the beginning of the experiment and became less as the later measurements were made. Decapitation decreases the normal rate of growth fully one fourth, and this reduction in growth will be shown in the diminished curvature when compared with the normal rate of growth in shoots which causes strong curving in a few hours.

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[1] Compt. Rend., 116 (1893), No. 24, pp. 1394–1396 (E. S. R., 5, p. 112).

The author conducted a series of experiments to determine why the decapitated plants did not undergo heliotropic curving. A number of plants in which heliotropism had been induced were decapitated and compared with uninjured shoots, showing that it was due to decapitation temporarily destroying the heliotropic sensitiveness. The remaining part of the shoots is insensible to the irritation caused by one-sided illumination. Decapitation in this case caused a strong diminution in the rate of growth, and temporarily caused a total loss of sensitiveness toward external irritants.

A series of experiments was conducted in which vertical incisions in or near the top of the cotyledon were made to ascertain whether this form of injury would have the same effect on heliotropism as decapitation. But little effect was noticed, showing, in the author's estimation, that the phenomena described above are not due to the wounding of the shoots, but are to be attributed exclusively to the removal of the connection between the top and the remaining body of the cotyledon.

Since the specific irritation produced by decapitation acts downward from the cut along the cotyledon, the author made some experiments to ascertain whether this irritation is transmitted to any considerable distance or whether its effect is circumscribed within narrow limits. He found that if the top is cut off for several millimeters the action extends over the entire length of the shoots; but if ½ to 1 mm. is removed the action is carried to a much less distance, the time which transpires before the effect of decapitation manifests itself varying from 3 to 6 hours, and the heliotropic sensitiveness of the decapitated shoots was reëstablished within 24 hours. The characteristic unequal distribution of the sensitiveness of the shoot was arrested and the upper end became more sensitive than the lower part, showing that a regeneration of the injured top had taken place in the upper end of the decapitated shoot as soon as the physiological properties of the normal top were restored, proving that these properties do not reside in any definite morphological part of an organ and are not connected with any definite anatomic structure. It is further shown that shoots decapitated after the induction of heliotropism become not only insensible to heliotropic irritation, but also to geotropic, and that decapitation has the same effect on geotropism of shoots as it has upon heliotropism.

Experiments were conducted which showed that the loss of geotropic curving is due to the loss in rapidity of growth and also the loss of geotropic sensitiveness. Experiments by the author show that the top of the cotyledon possesses a very strong geotropic sensitiveness, and that being concentrated at or near the top of the cotyledon it must be admitted that the geotropic irritation is transmitted downward from the top along the cotyledon. Otherwise the geotropic and heliotropic curving would have been different instead of showing the same phenomena.

The author's conclusions are that decapitation of the cotyledons of *Gramineæ* (*Avena sativa, Phalaris canariensis, Setaria viridis*) causes two effects independent of each other, namely, a strong retardation of growth, and the loss of geotropic and heliotropic sensitiveness. If the top is cut from plants where heliotropism and geotropism has been induced in the shoots the curving is due to after action and they will not respond to the new action of irritants. The effects of decapitation last but a few hours, after which the rapidity of growth as well as susceptibility to irritants are gradually restored and at the end of 24 hours become altogether normal. Experiments on *Avena sativa* show that the previously unequal distribution of heliotropic sensitiveness is destroyed. In experiments with shoots of *Brassica napus* decapitation produced effects essentially the same so far as the principles involved are concerned.

Conçerning copper from the standpoint of toxicology, A. TSCHIRCH (*Das Kupfer vom Standpunkte der gerichtlichen Chemie, Toxikologie und Hygiene; abs. in Chem. Ztg., 18 (1894) No. 102, Repert., p. 329*).—The author, contrary to the opinions of many others, says that copper is not injurious to plants. The salts of copper, such as the sulphate, chlorid, nitrate, etc., are corrosive and do exert an injurious effect on plant life. Plants grown in soil that contained insoluble copper compounds are said to have taken up some of this copper without any injury. Water cultures of *Phaseolus multiflorus* were grown in nutrient solutions containing 2 gm. of copper oxid to every 3 liters of the solution. The roots were thoroughly aërated from time to time and no injury was apparent to the plants. Experiments were made with 36 culture plants under the above conditions and their growth was stronger and the plants appeared more vigorous than parallel cultures where the nutrient solution contained no copper.

Synopsis of North American Amarantaceæ, II, E. B. ULINE and W. L. BRAY (*Bot. Gaz., 20 (1895), No. 2, pp. 155–161*).—A revision of the species of *Acnida* and *Gomphrena* is given.

A revision of the genus Cordyceps, G. MASSEE (*Ann. Bot., 9 (1895), No. 33, pp. 1–44, pls. 2*).—The author enumerates 62 species, one of which, *C. velutipes*, is described as new. Of those fully described 22 species are peculiar to the Old World, 23 to the New World, and 6 are common to both.

A popular treatise on the physiology of plants, P. SORAUER (*Translated by F. E. Weiss. London and New York: Longmans, Green & Co*).

Anatomy of the leaves of Arctic plants, F. BOERGESEN (*Jour. Bot. France, 9 (1895), No. 1, pp. 1–7; No. 2, pp. 21–27*).—In the main the conclusions are the same as given by G. Bonnier (E. S. R., 6, p. 616).

A contribution to the comparative anatomy of coniferous fruits, M. RADAIS (*Ann. Sci. Nat. Bot., 19 (1894), No. 3–6, pp. 165–368, pls. 15*).

Aërial roots of carnations, B. D. HALSTED (*Garden and Forest, 8 (1895), pp. 158, 159*).—An account is given of the presence of aërial roots on carnations. The author thinks their presence was probably due to surplus moisture as well as a tendency of some individual plants to throw out such roots.

Concerning the opening mechanism of flowers, C. STEINBRINCK (*Ber. deut. bot. Ges., 13 (1895), No. 2, pp. 55–61, figs. 5*).

Concerning the opening and closing of flowers, F. OLTMANNS (*Bot. Ztg., 53 (1895), I, No. 2, pp. 31–52*).

The spontaneous movements of leaves of the Leguminosæ and Oxalideæ, A. RODRIGUE (*Bul. Soc. Bot. France, 41 (1894), pp. CXXVIII–CXXXIV*).

The functions of the beards on barley, A. ZOEBL and C. MIKOSCH (*Sitzungsber. kgl. Akad. wissensch. Wien, 1892; abs. in Ann. Agron., 21 (1895), No. 3, pp. 143, 144*).

Concerning the structure and arrangement of the laticiferous tissue with special reference to gutta-percha and caoutchouc bearing plants, O. CHIMANI (*Bot. Centbl., 61 (1895), Nos. 10, 11, and 12, pp. 353–360, 385–395, and 417–426*).

Some factors influencing the health of plants under glass, B. T. GALLOWAY (*Amer. Florist, 10 (1895), pp. 930–932*).—An address delivered before the New York Florists' Club, April 8, 1895.

Remarks concerning the necessary amount of light for plants, J. WIESNER (*Ber. deut. bot. Ges., 12 (1894), Generalversammlungs number, 1895, Feb. 12, pp. 78–89*).

The effect of diastatic ferments on reserve cellulose, J. GRUSS (*Ber. deut. bot. Ges., 12 (1894), Generalversammlungs number, 1895, Feb. 12, pp. 60–72*).

The existence and localization of emulsin in Manihot spp., L. GUIGNARD (*Bul. Soc. Bot. France, 41 (1894), pp. CIII–CVII*).

On the presence of essence of wintergreen in various plants, E. BOURQUELOT (*Bul. Soc. Bot. France, 41 (1894), pp. XXXVII–XL*).—In addition to species of *Gaultheria* and *Betula* it is reported as found in *Polygala* spp. and *Monotropa hypopytis*.

On the distribution of phosphorus in plants, G. POLLACCI (*Malpighia, 4, No. 8 and 9, p. 19; abs. in Bot. Centbl., 61 (1895), No. 11, pp. 399, 400*).

On the classification of mucilage found in plants, L. MANGIN (*Bul. Soc. Bot. France, 41 (1894), pp. XL–XLIX*).—The various kinds of mucilage are classified according to their action toward certain chemicals, into cellulose, pectose, callous, mixed and intermediate.

The reasons for the disappearance of reserve material in seeds (*Flora, 79 (1894), pp. 419–429; abs. in Bot. Centbl. Beihefte, 5 (1895), No. 1, p. 23*).

The nutrition of green plants by glycerin, E. ASSFOHL (*Jour. Pharm. et Chim., 14 (1894), ser. 5, No. 12, p. 558; Ann. Agron., 1894, Oct. 28*).

Phenological notes on abnormal inflorescence observed in the autumn of 1893, A. MAGNIN (*Ann. Soc. Bot. Lyons, 19 (1894)*).

Concerning the symbiosis of Helianthus tuberosus and H. annuus induced by grafting, H. VÖCHTING (*Sitzungsber. kgl. Akad. wissensch. Math. phys. Classe, 1894, July 12; abs. Bot. Ztg., 53 (1895), II, No. 7, pp. 112–115*).

A room for constant temperature, W. PFEFFER (*Ber. deut. bot. Ges., 13 (1895), No. 2, pp. 49–54, fig. 1*).—A description of an apparatus for regulating the temperature of a room.

Investigations on nuclear division, DEGAGNY (*Bul. Soc. Bot. France, 41 (1894), No. 8 and 9, pp. 588–596*).

The effect of the repression of certain bacteria through the continued cultivation of legumes, A. HILL (*Ztschr. landw. Ver. Hessen, 1895, No. 11, pp. 81, 82*).—The author claims that the continued cropping of legumes will fill the soil with only those bacteria concerned in the assimilation of free nitrogen to the entire displacement of all neutral forms.

Experimental evolution amongst plants, L. H. BAILEY (*Amer. Nat., 29 (1895), pp. 318-325*).—An abstract of an address before the Massachusetts Horticultural Society, February 23, 1895.

Flowers and insects, XIV, C. ROBERTSON (*Bot. Gaz., 20 (1895), No. 4, pp. 139-149*).—A continuation of the observations of the author on the mutual adaptations of flowers and their insect visitors, with lists of insects observed to visit certain flowers.

Guide to the study of common plants, an introduction to botany, V. M. SPALDING (*Boston: D. C. Heath & Co., pp. 294*).

METEOROLOGY.

The needs of meteorology, C. ABBE (*Science, 1895, Feb. 15, pp. 181, 182*).—Considered as a source of climatological statistics and as a system for the prediction of the weather for a day or two in advance, meteorology has received enthusiastic support. About all that can be done by the utilization of the telegraph and weather map and the application of general average rules is now being done; but we are still powerless in the presence of any unusual movement of the atmosphere. Meteorologists must have a deeper insight into the mechanics of the atmosphere. It is not enough to know what the conditions have been and are, but we must know what they will be and why. A complete and rigorous deductive treatise on the laws governing the atmosphere is needed—a treatise on the application to the atmosphere of the dynamics and thermodynamics of gases and vapors. The preparation of such a work demands appropriate laboratory arrangements. Hence the great need of meteorology at present is the establishment of laboratories and the consecration of physicists and mathematicians to the science. The applications of climatology to geology, physiography, hygiene, irrigation, and other matters have been developed, but meteorology itself still remains to be provided for. Our universities should recognize the science to a greater extent in their courses of study and provide for meteorological laboratories.—O. L. FASSIG.

Rainfall and snow of the United States compiled to the end of 1891, M. W. HARRINGTON (*U. S. Dept. Agr., Weather Bureau Bul. C, pp. 80, fig. 1, charts 23*).—Tables give the annual precipitation in the United States (1738 to 1891); annual and seasonal averages, seasonal variation, and cubic miles for each State; mean daily rainfall for 18 to 28 years at 12 selected stations expressed as a percentage of days on which rain fell; combined averages of hourly occurrences of precipitation at Blue Hill Observatory, near Boston, Massachusetts, Washington, D. C., and Central Park, New York, New York; details of precipitation, and heaviest rainfalls at selected representative stations. Colored charts (published separately) show rainfall (January to December), rainfall for seasons, rainfall for the year, snowfall (in inches), monthly maxima of rainfall, rainy seasons, monthly minima of rainfall, details of rainfall, and details of occurrence of thunderstorms. The text discusses, under the head of mean amounts of rainfall, least rainfall, greatest rainfall, topography and its effects on rainfall, snow, distribution by States, disposal of the rainfall, variation in the annual rainfall, daily rainfall, and hourly rainfall; under relative amounts of precipitation, curves, maximum monthly rainfall, rainy seasons, minimum monthly rainfall, probability of rain, and character of rainfall; under special features of rainfall, heaviest rainfall, consecutive days with and without rain, and thunderstorms.

"The statistics of rain and snow, here given, include the most important series of observations that have been made from the early settlement of the country to the close of the year 1891.

"The collection embraces the records originally contributed to the Smithsonian Institution in manuscript, and others collected by that Institution from private individuals, those from the published journals of scientific societies and other associations, those made under the direction of the Medical Department of the U. S. Army, the Lake Survey, the Regents of the University of the State of New York, the Central and Southern Pacific Railways, the various State Weather Services and meteorological associations, the Signal Service, and, finally, the Weather Bureau, which succeeded it."

Depth of snow on ground during February, 1895 (*U. S. Dept. Agr., Weather Bureau, Weekly Snow Charts for Feb., 1895*).—The charts for February show a very unusual extent of snow-covered ground during the greater part of the month. February 11 the entire country, with the exception of the southern portions of the Gulf States and the Pacific Coast, had a depth varying from 1 in. in the South to 15 in. in the Northwest and Northeast, and 35 in. in upper Michigan. By February 28 it had practically disappeared from all portions of the United States excepting the lake regions and the extreme Northeast.

The chart for Feb. 11 contains an interesting note relating to the cold period of Feb. 1 to 11.

"At a majority of stations over the central and southern portions of the country the minimum records for the first decade of February have been lowered. At Galveston and New Orleans, where the records cover nearly a quarter of a century, the minimum temperature of February 8 reached 14° and 16°, respectively, that at Galveston being 14° below any previous record of the first decade of February, the record at New Orleans being lowered by 9°."—O. L. FASSIG.

Monthly Weather Review (*U. S. Dept. Agr., Weather Bureau, Monthly Weather Review, 22 (1894), Nos. 9–11, pp. 351–485, charts 19*).—These numbers include the usual notes and summaries. Beginning with the September number a new section on "Meteorology and magnetism" is introduced.

"In response to the request of the chief of the Weather Bureau, the directors of the observatories at Toronto, Washington, and San Antonio have courteously undertaken to forward to the Bureau, as promptly as possible, certain data from their magnetograms, namely, the mean ordinates for the day from 24 hourly readings of the horizontal force, the declination, and the vertical force, uncorrected for instrumental errors and changes of temperature. On days exhibiting very disturbed magnetic conditions the hours and the values of the maximum and minimum ordinates are given.

"The object in collecting these data is to institute a comparison between the crude magnetic readings, particularly of the bifilar, and the temperature changes at meteorological stations in the Northwest. Ultimately such comparisons will show how far unreduced magnetic observations may be available for determining the direction and the intensity of the temperature variations and other weather conditions before these become fully developed, as given by the isotherms and isobars of the daily weather maps. It has already been shown that weather and magnetism conform on the average to a normal type, but the problem of the synchronous changes from day to day is still under advisement as a practical feature in forecasting."

Wreck and casualty chart of the Great Lakes, 1894 (*U. S. Dept. Agr., Weather Bureau, 1 chart with text, 25 by 36 in., Feb., 1895*).—This chart gives in detail the number of casualties occurring on Lakes Superior, Michigan, Huron, Erie, and Ontario, and the connecting rivers during the season of 1894, and includes besides the record of total loss of 44 vessels and cargoes, involving a loss of $643,243, the partial loss of 68 vessels and cargoes to the amount of $349,544, and the sacrifice of 68 lives.—O. L. FASSIG.

Meteorology in France during 1892, E. MASCART (*Ann. Bureau Central Météorol. France, 1892, 3 vols. Paris: 1894*).—The following memoirs occur annually in volume I of this series: Summary of thunderstorms in France; magnetic observations made at the observatory of Parc Saint-Maur; magnetic observations made at the observatory of Perpignan; magnetic determinations made in France; study of the progress of the phenomena of vegetation and the migration of birds; meteorological observations made at the Central Meteorological Bureau and upon the Eiffel Tower. Besides the above annual reports the volume contains: First series of meteorological observations made on Mont Blanc in 1887, by J. Vallot; remarks upon the observations made on the summit of Mont Blanc in 1887, by A. Angot; summary of studies of the progress of phenomena of vegetation and the migration of birds in France during the 10 years 1881–'90, by A. Angot; squalls and thunderstorms, by E. Durant-Gréville.

Volume II contains the observations made during the year at 126 stations in France, 36 stations in Algeria, and at 23 colonial stations. Volume III contains a detailed statement of rainfall at 409 stations in France.—O. L. FASSIG.

Rainfall of the Hawaiian Islands, J. HANN (*Meteorol. Ztschr., Wien (1895), pp. 1–14*).—The islands lie in the heart of the northeast trades. According to McKibben, the trades prevail during 258 days at Honolulu. This insures a constant temperature, but great variation in rainfall in the mountainous regions.

The greatest precipitation occurs on the windward side of the southeasterly and largest of the islands, Hawaii, which has a maximum fall of about 600 cm. (240 in.). The minimum fall occurs on the southern plains of Oahu and along the southwest coast of Maui, reaching scarcely 40 cm. (16 in.).

Rainfall at Honolulu.

Month.	1873–'92.	1881–'90.	Month.	1873–'92.	1881–'90.
	Cm.	*Cm.*		*Cm.*	*Cm.*
January	101.6	73.2	August	58.0	64.3
February	116.3	127.3	September	46.9	49.9
March	96.0	180.0	October	57.9	56.1
April	79.2	85.4	November	131.3	133.7
May	80.2	86.9	December	124.8	120.1
June	46.1	44.2			
July	63.3	66.1	Whole year	1,001.9	1,015.2

—O. L. FASSIG.

Rainfall in Tacubaya, Mexico, M. MORENO Y AUDA (*Bol. Obs. Astr. Nat. de Tacubaya, vol. 1, No. 20, pp. 324–329, pl. 1*).—The following is a summary of results during 10 years (1884–'93):

Rainfall during 10 years in Tacubaya, Mexico.

Year.	Rainfall.		No. of rainy days.		Total rainfall.
	Jan. to June.	July to Dec.	Jan. to June.	July to Dec.	
	Mm.	*Mm.*			*Mm.*
1884	143.3	349.2	21	71	492.5
1885	143.6	535.4	35	69	679.0
1886	169.9	413.0	25	53	582.9
1887	355.2	491.3	43	74	846.5
1888	199.5	432.7	29	83	632.2
1889	236.7	476.5	39	64	713.2
1890	297.2	495.3	35	82	792.5
1891	287.3	495.7	41	69	783.0
1892	160.6	325.2	39	52	485.8
1893	287.3	439.7	48	75	727.0
	228.1	455.4	35.5	69.2	683.5

The monthly normals calculated from the 10 years' observations are as follows:

Monthly normal values, 1884–'93.

Month.	Millimeters.	Month.	Millimeters.
January	2.3	July	107.5
February	5.3	August	140.1
March	14.9	September	128.4
April	21.2	October	62.5
May	48.5	November	12.4
June	136.0	December	4.6
Total	228.1	Total	455.4

—O. L. FASSIG.

Meteorological observations at Upsala, Sweden, 1894, H. H. HILDEBRANDSSON (*Bul. mensuel Observ. Météorol. Univ. Upsala, 26 (1894), pp. 74*).—The records for pressure, temperature, humidity, direction, and velocity of wind are given in hourly values.

The mean temperature for the year was 6° C.; mean maximum, 10.2°; mean minimum, 1.6°; humidity, 81; cloudiness, 6.1; and rainfall, 486.5 mm.—O. L. FASSIG.

Meteorological observations at Porto Rico, 1894 (*Resumen observ. meteorol. verif. Jefatura de Obras Públicas Isla Puerto-Rico, 1894*).—The summary for the year is as follows: Maximum temperature at the surface of the ground, 36° C.; maximum temperature in the shade, 33.2°; mean temperature in the shade, 23.1°; minimum temperature, 14°; total rainfall, 1,227.7 mm.; maximum rainfall in one day, 53 mm.; total evaporation, 2,357.7 mm.; maximum evaporation in one day, 15 mm.; order of frequency of the wind, E., SE., NE., S., NW., N., W., SW. The mean shade temperature for 15 years was 23.9° C.; mean rainfall for 20 years, 921.8 mm.; mean evaporation for 20 years, 2,501.5 mm.; order of frequency of winds during 20 years, E., NE., SE., N., S., NW., SW., W.—O. L. FASSIG.

On hail, R. RUSSELL (*London: 1893, pp. 224, pls. 2*).—This is a valuable compilation of statistics relating to hailstorms and hailstones. The contents of the book are well indicated by the chapter headings: (1) Descriptions of hailstorms and hailstones; (2) observations of temperature, clouds, and winds at great altitudes (balloon ascents); (3) electricity and hail; (4) theories of hail; (5) certain properties of vapor, water, ice, and conditions of the air which may be connected with the formation of hail; (6) summary of characteristics of hailstorms and hailstones; (7) the development of a hailstorm; (8) conclusions.

Appendixes: (A) General weather conditions in certain hailstorms, (B) cold produced by radiation from the upper strata of clouds and fog, (C) dust particles and the form of ice crystals, (D) types of hailstorms, (E) notes on recent thunderstorms and hailstorms, (F) storms of hail and rain produced by mixture of winds.—O. L. FASSIG.

Recent foreign studies of thunderstorms, R. DEC. WARD (*Amer. Met. Jour., 11 (1895), No. 12, pp. 435–441*).—A review of investigations in this line in Switzerland.

The influence of the snow covering on soil and climate, M. WINTER (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 7, pp. 108, 109*).

Daily weather maps.—The countries which issued weather maps during 1894, the area covered by each (in parenthesis), and the years of publication are: Austria (Europe), eighteenth year of publication; Algeria (Europe and northern Africa), nineteenth year of publication; Belgium (southern, western, and northern Europe), eighteenth year of publication; France (Europe), thirty-eighth year of publication; Germany—Hamburg (Europe), nineteenth year of publication; Germany—Bavaria (Europe), fourteenth year of publication; Germany—Saxony (Europe), seventeenth year of publication; Great Britain (British Isles and western Europe), twenty-seventh year of publication; India (India and Burma), sixteenth year of publication; Italy (southern Europe), sixteenth year of publication; Japan (Japan), twelfth year of publication; Russia (Europe), twenty-third year of publication; Spain (Spain, France, and northern Italy), second year of publication; United States (United States and southern Canada), twenty-fourth year of publication; Switzerland (Europe), fourteenth year of publication.

Most of these maps have been received in the library of the Weather Bureau of this Department.—O. L. FASSIG.

Weather record at Newport (Arkansas) Substation for the season of 1894, G. B. IRBY (*Arkansas Sta. Bul. 31, p. 32*).—A daily record of maximum and minimum temperatures and rainfall for 7 months (April to October).

Meteorological summaries for North Carolina for December, 1894, H. B. Battle, C. F. von Herrmann, and R. Nunn (*North Carolina Sta. Weather Service Bul. 63, pp. 187–200, maps 2*).—The usual summaries of observations of the State Weather Service coöperating with the Weather Bureau of this Department.

Notes on climate of Wyoming, B. C. Buffum (*Wyoming Sta. Rpt. 1894, pp. 36–45*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 18).

Observations of the New England Weather Service, 1893 (*Annals of Harvard Coll. Observatory, vol. 41, No. 2, pp. 33–61, pl. 1*).—The usual annual summary of observations from about 200 stations, with general characteristics of the weather, and enumeration of the principal cyclonic disturbances during the year. The following departures from annual normal values during the period 1885–'93 are given:

Departures from annual normals, 1885–'93.

	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
From the temperature normal (degrees)	−1.3	−0.40	−0.50	−1.80	+1.70	+0.10	+1.4	+0.20	−1.40
From the precipitation normal (in.)	−1.2	+0.93	+2.69	+11.76	+4.25	+4.59	+0.2	−0.48	−0.29

—O. L. FASSIG.

Weather and crops, C. E. Linney (*Illinois State Weather Service (1895), No. 1, pp. 8*).—The central office of the Illinois State Weather Service was recently transferred from Springfield to Chicago, with W. L. Moore in charge. "Weather and Crops" is the title of the official monthly publication of this service. It is a very creditable addition to the numerous State Weather Service monthly reviews.—O. L. FASSIG.

Weather Service in Pennsylvania.—In a communication to the senate and house of representatives of the State of Pennsylvania from the Franklin Institute (6 octavo pages) the value of a State Weather Service is set forth and an appropriation of $6,000 for maintaining such a service is urged.—O. L. FASSIG.

Temperature and rainfall charts for the Dominion of Canada, January, 1895.—The Central Meteorological Office at Toronto has begun the issue of monthly charts, of which this seems to be the first, showing the mean temperature and the difference from the mean average temperature, the total rainfall and snowfall, and the depth of the snow on the ground on the last day of the month. The size of the map is about 24 by 11 in. The region covered is a narrow belt of about 4 degrees, extending from the Atlantic to the Pacific.—O. L. FASSIG.

Central American rainfall, M. W. Harrington (*Phil. Soc. Washington, Bul. 13 (1895), pp. 30, pls. 4*).—This paper deals with the nature and extent of observations recorded; geographic conditions; annual rainfall; distribution during the year; distribution through the day at San José, Costa Rica; and variation of rainfall.

Snow charts of Austria, winter of 1894–'95 (*K. K. Österr. Central Bureau hydrog. Dienst, Wien*).—Charts showing depth of snow on the ground on Saturday of each week in the drainage area of the Danube, with tabular review.—O. L. FASSIG.

Meteorological observations in Würtemberg in 1893 (*Deut. Met. Jahrbuch, 1893, pp. 69, pls. 2*).—This volume contains the records from 100 stations for observing meteorological and phenological phenomena. The establishment of a station of the first order at Hohenheim is described by Prof. Dr. Mack, who also discusses the daily periods of rainfall from observations covering a period of 10 years at this station.—O. L. FASSIG.

Indian meteorological memoirs (*Volume V, parts IV, V, and VI. Calcutta: 1894*).—Volume V treats of the diurnal variation of atmospheric conditions in India, being a discussion of the hourly observations recorded at 25 stations since 1873. Part IV discusses the hourly observations at Allahabad; part V, the observations at Lucknow; part VI, the observations at Agra.—O. L. FASSIG.

Instructions to observers of the India Meteorological Department, J. ELIOT (*Calcutta: 1894, pp. 103, pls. 3*).—This pamphlet of "instructions" is intended to supersede the well-known and excellent "Indian Meteorologist's Vade Mecum" published in 1877, but is much reduced in size and scope. It is confined to a description of the various instruments in use at the meteorological observatories in India, as all reductions of observations are made at the Meteorological Office, Calcutta.—O. L. FASSIG.

Meteorological observations in Italy, 1890 (*Ann. Uff. Cent. Meteorol. Geod. Ital., 12 (1890), II. Roma: 1895, pp. 383*).—Part II of the Annali contains the decade, monthly, and annual means for all stations in Italy under the direction of the national central office. In addition to the ordinary observations the amounts of evaporation are given for 63 stations for each decade.—O. L. FASSIG.

Meteorological observations in Mexico, 1894 (*Obs. Met. Magnét. Central., 1894, Dec. Mexico: pp. 9*).—Summaries for December, with annual means.

Russian Monthly Weather Review, Jan.-Dec., 1894 (*St. Petersburg: 1894*).—The reviews contain the ordinary meteorological observations for about 75 stations in the Russian Empire. Each number comprises 10 large quarto pages of tabular matter, and text (in the Russian language), together with a chart showing the mean monthly pressure and temperature and total rainfall.—O. L. FASSIG.

Meteorological observations in Sweden during 1890 (*Acad. Roy. Sci. Sweden, 32 (1890). Stockholm: 1894, pp. 155*).—The volume is divided into 3 sections. The first contains observations *in extenso* at 18 stations, the second the monthly and annual means of all meteorological elements for 37 stations and of temperature for 93 stations, and the third pentad means for the 37 stations of part 2.—O. L. FASSIG.

WATER—SOILS.

Further investigations on the soils of Maryland, M. WHITNEY and S. KEY (*Maryland Sta. Bul. 29, pp. 153–174*).—A brief discussion of "some of the underlying principles of the relation of soils to crops" more fully treated in the Annual Report of the station for 1891 (E. S. R., 4, p. 17) and Bulletin 21 of the station (E. S. R., 5, p. 162), with a report on physical examinations of typical truck and wheat soils of the Eastern Shore of Maryland; limestone soils of the Cumberland and Frederick Valleys; mountain peach soils (Cambrian sandstone); gneiss soils (corn and wheat) from Bel Air, Darlington, Churchville, and Glenville; and wheat and corn soils of southern Maryland.

Soil temperature observations in Cordova, Argentine Republic (*An. Ofic. Meteorol. Argentina, vol. IX. Buenos Ayres: 1891*).—Observations of temperature in the soil at the surface and at depths of 0.1, 0.25, 0.5, 1.2, 2.7, and 3.75 meters are reported. A summary of results for the year is given in the following table:

Soil temperatures (degrees C).

	At surface	0.1 meter	0.25 meter	0.5 meter	1.2 meters	2.7 meters	3.75 meters.
Maximum	29.4	25.6	24.2	22.8	21.5	22.0	20.2
Minimum	2.9	5.3	6.8	10.0	13.8	14.9	17.8

—O. L. FASSIG.

Soil temperatures in Bombay, India, 1893 (*Mag. and Met. Observ., Government Observatory, Bombay, 15 (1894), No. 15, pp. 12*).—Soil temperatures are reported for depths of 1, 9, 20, 60, and 132 in. below the surface, the 2 former 5 times daily, the 3 latter once a day at 2 p. m. The maximum and minimum readings were as follows:

Soil temperatures (degrees F.).

	1 inch.	9 inches.	20 inches.	60 inches.	132 inches.
Maximum	85.6 (May)	84.9 (May)	85.8 (June)	85.6 (June)	84.0 (July).
Minimum	74.8 (Feb.)	75.0 (Feb.)	78.0 (Feb.)	80.9 (Feb.)	81.2 (March).

—O. L. FASSIG.

Analyses of drinking water, J. L. HILLS and B. O. WHITE (*Vermont Sta. Rpt. 1893, pp. 22–25*).—Analyses with reference to sanitary condition of 25 samples of spring water, 17 of well water, 7 of pond and aqueduct water, and 10 of Lake Champlain water are tabulated.

Soil temperatures, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, p. 42*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 23).

Investigations on the radiation of heat by the soil, J. AHR (*Forsch. Geb. agr. Phys., 17 (1894), No. 5, p. 397*).

Exhaustion of soil by trees (*Garden and Forest, 8 (1895), pp. 142, 143*).—Quotes a letter from B. E. Fernow on the subject.

The reclamation of arid lands, A. A. JOHNSON (*Wyoming Sta. Rpt. 1894, pp. 47–65*).—A reprint from Bulletin 18 of the station (E. S. R., 6, p. 345).

FERTILIZERS.

The world's consumption of fertilizers—nitrate of soda, MAZIÈRES (*L'Engrais, 10 (1895), Nos. 13, pp. 299, 300; 14, pp. 324, 325*).—The amount and value of nitrate of soda consumed in different countries is stated to be as shown in the following table:

Consumption of nitrate of soda in different countries.

	Amount consumed.					Value in 1894.[1]
	1890.	1891.	1892.	1893.	1894.	
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
Germany	316,300	368,400	366,800	349,000	397,200	$15,848,280
France	197,900	183,400	175,400	175,700	187,100	7,465,290
England	119,000	124,400	118,800	101,800	117,000	4,668,300
Belgium	91,600	94,600	95,100	100,000	123,700	4,835,630
Holland	47,200	48,500	47,400	53,700	56,700	2,262,330
Italy and Spain	13,800	9,300	8,500	9,000	5,200	207,480
America	103,000	100,000	100,000	104,000	100,000	3,990,000

[1] The value per ton is taken as 210 francs, or $39.90. The French ton contains 2,204.6 lbs.

The influence of the mineralogical composition of rocks on vegetation, F. X. GILLOT (*Bul. Soc. Bot. France, 41 (1894), pp. XVI–XXXVI*).—Investigations are reported which led to the following conclusions: The appearance of certain species of plants usually associated in soil apparently different from that of its ordinary habitat (heteroptic colonies) depends not only on the presence of sufficient chemical elements in the soil, but also on the combinations and proportion of these elements in the soil and in the minerals from which they are derived, and on the power which the plants possess of utilizing these fertilizing elements.

Recent investigations on the nitric ferment, VOGEL (*Jahrb. deut. Landw. Ges., 9 (1894), pp. 28-30*).—A brief review of the work of Winogradsky, Stutzer, Rubner, A. Müller, and Tacke.

Bones, their manufacture in fertilizers and value in agriculture, BRAUER (*Jahrb. deut. Landw. Ges., 9 (1894), pp. 30-34*).—A popular article.

The utilization of the nitrogen in green manures and in stable manure, J. KÜHN (*Landbote, 16 (1895), No. 18, pp. 155-157; No. 19, pp. 166-169*).—See E. S. R., 6, p. 396.

Gulick's mineral fertilizer, P. COLLIER (*Cult. and Country Gent., 1895, Apr. 4, p. 264*).

Genuineness of basic slag, F. SESTINI (*Staz. Sper. Agr. Ital., 26 (1894), pp. 57-62; abs. in Jour. Chem. Soc. London, 68 (1895), Mar., p. 86*).

The phosphate deposits of North America, WOHLTMANN (*Jahrb. deut. Landw. Ges., 9 (1894), pp. 101-119*).—A brief discussion of character and extent of deposits, composition, market price, and exports of Canada, South Carolina, and Florida phosphates, with remarks on their importance to German agriculture.

Fertilizer experiments of the German Agricultural Society, C. NÖRMER (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 8, pp. 127, 128*).

Tables for calculating fertilizer analyses, H. B. MCDONNELL ET AL (*Maryland Sta. Bul. 29, Appendix, pp. 16*).—Tables show (1) side by side the per cent of phosphoric acid and tri-calcium phosphate corresponding to the weight of magnesium pyrophosphate calculated for 0.4 gm. substance; (2) phosphoric acid corresponding to weight of magnesium pyrophosphate calculated for 0.4 and 0.5 gm. substance and for each tenth of a milligram; (3) potash, K_2O, corresponding to weight of $KPtCl_6$ calculated for each milligram and for 1 gm. substance; (4) per cent of nitrogen corresponding to each tenth cubic centimeter of one tenth normal solution; (5) per cent of ammonia, NH_3, corresponding to each tenth cubic centimeter of one tenth normal solution; and (6) the value per ton of fertilizers from percentage for prices of 6, 3, and 2 cts. per pound.

Fertilizer analyses of the North Carolina Fertilizer Control, H. B. BATTLE (*North Carolina Sta. Special Buls. 22, pp. 10; 23, pp. 12*).—Tabulated analyses of samples of fertilizers accompanied by the usual explanatory notes.

Fertilizer inspection in Rhode Island, H. J. WHEELER and B. L. HARTWELL (*Rhode Island Sta. Bul. 30, pp. 59-65*).—Tabulated analyses and valuations of 27 samples of fertilizers; a table giving statistics of fertilizer inspection during 1894 and agreement of actual and guaranteed composition; and notes on valuation.

Report of analyses of fertilizers and feeding stuffs made under the act of 1893 (*Jour. [British] Board. Agr., 1 (1895), No. 3, pp. 276, 277*).—Four hundred and forty-four samples were analyzed during 1894, 317 being of fertilizers and 127 of feeding stuffs.

Analyses of fertilizing materials, J. L. HILLS and B. O. WHITE (*Vermont Sta. Rpt. 1893, pp. 21, 22*).—Analyses of 19 samples of wood ashes, 3 of muck, 1 of tankage, and 2 of a mixed fertilizer are tabulated.

Analyses of fertilizers licensed for sale in the State of Vermont in the year 1893, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 17-19*).—An abstract of Bulletin 35 of the station (E. S. R., 5, p. 164).

FIELD CROPS.

Alfalfa, how and where to grow it, C. W. IRISH (*pp. 11*).—This pamphlet gives directions for the choice and preparation of the soil, for sowing the seed, and for the management of the crop in semiarid regions, both with and without irrigation. The author states that the seed furnishes a valuable dyestuff and that for this use large quantities of seed are exported from this country to France. Several examples illustrating the depth to which alfalfa roots penetrate, and several instances of a successful catch of alfalfa secured without irrigation on light, sage brush land, by simply harrowing the surface without plowing, are given. On mountain slopes in Nevada it is claimed that the plant withstands extremely low temperatures. Young frosted shoots may induce bloating in animals, as will overfeeding with green alfalfa.

Fertilizer experiments with buckwheat, J. C. CHAPMAN (*Southern Planter, 56 (1895), No. 3, pp. 112, 113*).—This experiment was conducted on a well-worn clay loam soil near Fredericksburg, Virginia. The seed was sown July 25 at the rate of 15 qts. per acre. On account of drought the stand was very thin and the yield was very small. Neither gypsum, air-slacked lime, nor muriate of potash alone increased the yield over that of the unfertilized plats. Indeed, muriate of potash when applied at the rate of 100 lbs. per acre either alone or in combination appeared to reduce the yield. Nitrate of soda and superphosphate applied alone and in combination increased the yield. A complete fertilizer consisting of 120 lbs. of nitrate of soda, 340 lbs. of superphosphate, and 50 lbs. of muriate of potash gave the largest yield.

Analysis of burnet (Poterium sanguisorba), J. HENDRICK (*Rpt. Expts. Manuring, 1893, Glasgow and West Scotland Tech. Col. Glasgow: 1894, pp. 28, 29*).—The dry matter of burnet, cut just as the plant was coming into bloom, had the following composition:

	Per cent.
Nitrogenous matter	25.50
Fat	4.14
Nitrogen-free extract	53.18
Fiber	10.28
Ash	6.90
	100.00

The percentage of total nitrogen in the dry matter was 4.08, and of albuminoid nitrogen 2.78.

Serradella was also analyzed, and the dry matter afforded 3.54 per cent of total nitrogen and 2.01 per cent of albuminoid nitrogen.

Experiments with corn, R. J. REDDING (*Georgia Sta. Bul. 27, pp. 187–195*).

Synopsis.—Tests of fertilizers, of cotton-seed meal and cotton hulls applied together *vs.* cotton seed, variety tests, and an experiment in pulling fodder. All of the fertilizer mixtures caused a financial loss. Cotton-seed meal and hulls proved slightly superior to cotton seed. Fodder pulling yielded a slight net profit, although it reduced the yield by 2.77 bu. of corn per acre.

These experiments are in continuation of those reported in Bulletin 23 of the station (E. S. R., 6, p. 223). The weather conditions for the season are noted, the rainfall being tabulated.

Fertilizer experiments (pp. 188–190).—The basal mixture consisted of 312 lbs. of acid phosphate, 18 lbs. of muriate of potash, and 130 lbs. of nitrate of soda per acre, and cost $6. Every increase in one or more of the ingredients caused a financial loss, as did the basal mixture itself. The conclusions agree with those of previous years that it is not expedient to rely on commercial fertilizers for corn, but that this crop should follow a well-fertilized cotton crop. Nitrogen was the most effective of the 3 fertilizer constituents used.

Cotton-seed meal and hulls vs. cotton seed (pp. 194, 195).—Seven hundred and sixty-four pounds per acre of crushed cotton seed yielded 0.86 bu. of corn less than did the meal and the hulls obtained from the above amount of cotton seed, the quantities of minerals applied being the same with each.

Varieties (pp. 192, 193).—Of 13 varieties tested the largest yield (13.19 bu. per acre) was made by Shaw Improved.

Pulling fodder (pp. 190–192).—Pulling fodder (stripping the blades) reduced the yield of corn 2.77 bu. per acre. The yield of blades was 587 lbs. per acre on fertile land. With corn at 65 cts. per bushel and fodder at 75 cts. per 100 lbs., pulling fodder resulted in a net gain of 92 cts. per acre.

Varieties of corn, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 111–114*).—Tabulated data give the characteristics and composition of 13 varieties of corn. The largest yield of dry matter was made by Virginia Horse Tooth, Leaming, and Egyptian Sweet. The dry matter of the Egyptian Sweet corn had a larger nutritive value, pound for pound, than that produced from any other variety.

Field experiments with cotton, R. J. REDDING (*Georgia Sta. Bul. 27, pp. 196–210*).

Synopsis.—These consisted of (1) variety tests, in which Jones Improved gave the largest value of lint and seed; (2) distance experiments, in which the results favored a distance of 1 by 4 ft.; (3) fertilizer experiments; (4) an experiment in plowing under green pea vines, mature pea vines from which the peas had been picked, and pea vine stubble, resulting in favor of making hay of the vines and plowing under the stubble; and (5) a test of Florida phosphate *vs.* superphosphate, resulting in favor of the latter.

These experiments are in continuation of those reported in Bulletin 23 of the station (E. S. R., 6, p. 527).

Test of varieties (pp. 196–200).—Fifteen varieties were tested. The yield at each picking, number of bolls to a pound of seed cotton, number of seeds in 1 lb., yield of lint and seed, per cent of lint, and total value of lint and seed are tabulated. The largest yield of lint (628 lbs. per acre) and also of seed was made by Jones Improved; this variety stood second in size of boll and fourth in earliness.

The small seeded varieties "are better suited to thin or moderately fertilized soils, since they make smaller drafts on the soil; while the larger bolled, larger seeded varieties are perhaps better adapted for high culture, for strong or liberally manured soils."

Distance experiments (pp. 200–202).—In rows 4 ft. apart single stalks were left at distances of 1, 2, 3, and 4 ft. Both on the plats liberally fertilized and on the unfertilized plats the largest yield was made at distances of 1 by 4 feet. The following table gives the yields of seed cotton at each of these distances for each of the years during which the experiment has been in progress:

Yield of seed cotton at different distances.

	4 by 1 ft.	4 by 2 ft.	4 by 3 ft.	4 by 4 ft.
1891	1, 943	2 027	2, 007	1, 883
1892	1, 616	1, 516	1, 501	1, 430
1893	1, 903	1, 905	1, 925	1, 770
1894	2, 065	1, 812	1, 843	1, 671
Averages of 4 years	1, 882	1, 815	1, 819	1, 678

The author advises early planting when it is intended to give each stalk ample distance, and close planting as the northern limit of the cotton belt is approached.

Effect of increasing amount of fertilizer (pp. 202–204).—In this experiment a complete fertilizer was applied at the rate of 400, 800, and 1,200 lbs. per acre, and the results were compared with those secured on unfertilized plats. With the variety King the use of 400 lbs. of fertilizer resulted in a profit of 71 per cent on the investment for fertilizers; for the variety Jones Improved, 14 per cent. Using 800 lbs. of fertilizer there was a profit of 11 per cent with King, but a loss of 8 per cent with Jones Improved. Twelve hundred pounds of fertilizer resulted in a financial loss with both varieties.

General fertilizer experiments (pp. 205–207).—In 1894 the formula giving best results consisted of 468 lbs. of acid phosphate, 54.6 lbs. of muriate of potash, and 130 lbs. of nitrate of soda, and the mixture contained 10 per cent available phosphoric acid, 4 per cent potash, and 3 per cent nitrogen. With none of the fertilizer mixtures was there any considerable profit.

Green manuring with cowpeas (pp. 207–209).—Cowpeas planted after oats in 1893 were plowed under (1) green, or (2) after the peas had been picked, or (3) the stubble was plowed under, the vines being made into hay. The results agree with those of previous years in showing that the greatest profit (taking into consideration the value of the cotton crop of 1894 and the value of the cowpeas and hay in 1893) was obtained by making hay of the vines and plowing under the stubble.

Florida soft phosphate vs. superphosphate (pp. 209, 210).—Superphosphate in a complete fertilizer was compared with an equal amount and with larger amounts of Florida soft phosphate. Superphosphate at $14 per ton proved far superior both in yield and in financial returns to soft phosphate at $12 per ton.

Miscellaneous fodder crops, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 114–118*).—The composition and yield per acre of food constituents are tabulated for Japanese radish, spurry, millet, rape, soja bean, horse bean, and sunflowers, and for mixtures of peas, oats, and rape, hairy vetch and soja beans, hairy vetch and horse beans, and vetch, oats, and rape. The largest yield of dry matter, 7,491 lbs. per acre, was made by rape; this plant produced a larger crop when the drills were 6 in. apart than when planted at a distance of 27 in. apart. Japanese radish was refused by cattle; sunflower heads afforded 2,738 lbs. dry matter per acre, containing 607 lbs. of fat, a much larger quantity than that produced by any other crop.

American ginseng, G. V. NASH (*U. S. Dept. Agr., Division of Botany Bul. 16, pp. 22, figs. 2*).—The roots of ginseng (*Panex quinquefolium*) are exported to China, where they are used medicinally. The following topics are treated: History, description, geographical distribution, medicinal properties, commercial value, export statistics, protection against extermination, cultivation, composition, and preparation of ginseng for market.

> "There are two ways in which a start may be made in the cultivation of ginseng, viz, by transplanting the wild roots and by sowing seed. By the latter method from 4 to 7 years are required to produce the first crop of marketable roots, and the land yields no income in the meanwhile. The more speedy and better plan is to transplant wild roots of different ages. This is to be done in the fall of the year, the seed of the plants being collected at the same time and sown . . . The following autumn dig up the roots and replant all that are not of marketable size, sowing all the seed yielded by the bed."

A ginseng bed should be shaded, and hence its best location is in a wood from which the underbrush has been removed. It is recommended to plant the seed in drills 2 or 3 in. apart and 1 in. deep at the rate of 1 seed per inch. The seed should be sown as soon as gathered, or if kept for any time it should be packed in moist loam. If allowed to dry it will not germinate. Eighteen months usually elapse between planting and germination. When the plants are 2 or 3 years old they may be again transplanted to carefully prepared beds.

> "When the plants are from 4 to 7 years old, they are to be dug up in the fall, after the seed is gathered. They should then be sorted, all that are large enough for the market being taken out and the remainder replanted. In digging the roots great care should be exercised not to mutilate them, as their value is increased in proportion to their freedom from blemishes."

The consumption of ginseng is limited and there is a possibility of glutting the market. On the other hand, its culture requires but little capital, and when the price is low the roots can be left in the ground to await higher prices.

Flax culture, STREHL (*Jahrb. deut. landw. Ges., 9 (1894), pp. 137, 138*).—As the result of 10 years' work the author condemns the use of fresh stable manure on flax. An application of 540 lbs. of kainit and 27 to 54 lbs. of soluble phosphoric acid per acre is recommended. The kainit is applied in the fall, superphosphate before planting in spring. The use of nitrate of soda is not advised, as it may cause the crop to lodge.

Preparation of the soil, as thorough as for beets, is advised. Plowing so deep as to bring to the surface some raw soil is not regarded as injurious. A shallow seed bed is made and the seed is sown as early in the spring as practicable. Directions for harvesting and marketing flax and an estimate of the cost of flax production are given.

Flat pea, F. LAMSON-SCRIBNER (*U. S. Dept. Agr., Division of Botany Circular 4, pp. 7, figs. 2*).—The subjects treated are description, history, uses, cultivation, and rate of growth of the flat pea (*Lathyrus sylvestris*). The author believes more extensive cultivation is necessary before the true value of this plant can be definitely ascertained. It requires soil in which the water is at least 13 ft. below the surface. Its early growth is slow and it is usually not mowed until the third year.

Effect of fertilizers on lupines, DAMSEAUX (*Jour. Ass. Anc. Élèv. Gembloux, 4 (1894), No. 9, pp. 328–330; abs. in Centbl. agr. Chem., 23 (1894), No. 12, pp. 850, 851*).—The yields of yellow lupines, under the influence of different manures, are given in the following table:

Yield per acre of green material of yellow lupines and nitrogen contained therein.

	Yield per acre.	Nitrogen.
	Pounds.	*Pounds.*
No fertilizer	27,097	136
624 lbs. kainit	28,302	142
490 lbs. quicklime	33,008	166
490 lbs. quicklime 624 lbs. kainit	35,006	176
1,070 lbs. Thomas slag	32,076	160
1,070 lbs. Thomas slag 624 lbs. kainit	32,789	164

The yield was considerably increased where quicklime was used, although the yellow lupine does not prefer a strongly calcareous soil.

The unfertilized plat yielded 7,587 lbs. of fresh roots containing 1,517 lbs. of dry matter. The plat fertilized with lime and kainit, though making above ground a much larger yield of green material than the unfertilized plat, afforded only 5,569 lbs. of fresh roots containing 1,114 lbs. of dry matter.

The plants artificially provided with fertilizing materials produced a smaller amount of roots than those which were compelled to obtain their supply entirely from the soil.

Fertilizer experiments on meadows, R. P. WRIGHT (*Rpt. Expts. Manuring, 1893, Glasgow and West Scotland Tech. Col. Glasgow: 1894,* *pp. 13–26*).—These experiments were conducted in the favorable season of 1893 on 12 farms in the southwestern part of Scotland. In estimating profits only the first cutting or main crop of hay was considered. Were the value of the aftermath included, all fertilizers would show a profit.

Salt was applied early in May at the rate of 768 lbs. per acre, and as no rainfall followed the salt scorched the vegetation. However, the deep-rooted and valuable forage plants on most farms recovered from this injury, while the shallow-rooted weeds, especially the yellow rattle (*Rhinanthus crista-galli*) and *Holcus lanatus*, were to a considerable extent eradicated by the application of salt. This killing of weeds improved the quality of the hay on the plats receiving salt. Salt was more uniformly effective in augmenting the yield of timothy than of mixtures of other grasses and clover.

Nitrate of potash alone, at the rate of 224 lbs. per acre, increased the yield of hay, especially on the plats where there were some clover plants.

Potash in the form of muriate and kainit proved of practically equal value.

Muriate of potash, 224 lbs., and nitrate of soda, 208 lbs. per acre, in combination, largely increased the yield of hay and was profitable. With the addition to this of 312 lbs. of nitrate of potash the yield of hay very largely increased, especially on the timothy plat, the average increase being one fifth of a ton per acre.

Superphosphate gave variable results on different farms and on different species of grasses; on clover its action was especially favorable, but on the average its application to grass was not profitable. Non-nitrogenous mixed minerals proved beneficial on clover, but only slightly effective on grasses. Nitrate of soda alone and in combination resulted in a large and profitable increase in the yield of hay. In every case a complete fertilizer returned a profit.

In a grazing experiment cattle showed a preference for the grasses growing on the plats fertilized with nitrates, either alone or in combination.

Effect of fertilizers on the composition of hay, J. HENDRICK, (*Rpt. Expts. Manuring, 1893, Glasgow and West Scotland Tech. Col. Glasgow: 1894, pp. 27, 28*).—The author's analyses controvert the view sometimes expressed that the hay made from grasses fertilized with nitrates is of inferior nutritive value on account of its large proportion of non-albuminoid nitrogen. The plat receiving a complete fertilizer, in which the nitrogen was in the form of nitrate of soda, yielded hay richer both in total and in albuminoid nitrogen than that from any other fertilized plat.

When potash was applied alone the percentage of total nitrogen was small, but a large proportion of this was in the form of albuminoids.

Fertilizer experiments on oats, R. P. WRIGHT (*Rpt. Expts. Manuring, 1893, Glasgow and West Scotland Tech. Col. Glasgow: 1894, pp. 53–57*).—Commercial fertilizers were in most cases used with profit on the oat crop in the favorable season of 1893. Nitrate of soda applied alone was profitable as a top dressing on soils already in good condition, but on poor land the results were variable. When superphosphate was added to the nitrate of soda the result was more certain and profitable. A complete fertilizer was advantageously used on the oat crop following sod, but potash was not profitable when the preceding crop had been roots liberally fertilized with barnyard manure. Nitrate of soda was somewhat more effective than sulphate of ammonia, especially in the production of straw.

Peanuts, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 19–23*).—Two varieties grown at the station and at the two substations averaged 73 bu. per acre of selected nuts. The Spanish variety contained in every 100 lbs. of unshelled nuts 79 lbs. of kernels; the Virginia variety only 61 lbs. The Spanish is preferred as a food for hogs. Directions for the cultivation of peanuts are given.

Potatoes, a simple test of quality, E. S. GOFF (*Rural New Yorker, 1895, Apr. 6, p. 241*).—When potatoes are placed for a few minutes in brine the lightest or those of poorest quality and most deficient in starch rise to the top. By this method it is an easy matter with the aid of a hydrometer to determine the amount of starch and hence the quality of the potatoes.

The author planted the light, the medium, and the heavy potatoes as indicated by the brine test for 2 years in succession, and unlike European investigators, noted no improvement in the quality of the crops as a result of this selection. He found that tubers growing nearest the surface were of lowest specific gravity or poorest quality, and that the specific gravity increased with the depth at which the potato grew. This he ascribes to the cooler temperature found at greater depths. He also found that potatoes grown in level culture, with the consequent lower temperature within the soil, had a greater specific gravity than those grown in hills.

Giant knotweed or sachaline, F. LAMSON-SCRIBNER (*U. S. Dept. Agr., Division of Botany Circular 5, pp. 4, figs. 3*).—This circular treats of the general characters and history of sachaline (*Polygonum sachalinense*), its probable value as a forage plant and as a protection for river banks, and methods of propagating it. The general cultivation of this plant is not recommended.

Fertilizer experiments on turnips, R. P. WRIGHT (*Rpt. Expts. Manuring, 1893, Glasgow and West of Scotland Tech. Col. Glasgow: 1894, pp. 11, 12, 35–52*).—This experiment was conducted on 16 farms. Large and profitable crops of turnips were grown by the use of mixtures of commercial fertilizers without any farm manures. Phosphoric acid was the most effective fertilizing constituent applied. In the form of superphosphate it was in most cases more valuable than in slag and bone meal. However, on peaty or mossy soils slag was equally effective. Bone meal gave a smaller increase in the yield of turnips than basic slag and nitrate of soda applied together in such quantities as to furnish equivalent amounts of phosphoric acid and nitrogen. Sulphate of potash proved a profitable addition to phosphatic and nitrogenous fertilizers. Barnyard manure alone afforded large crops, but better results were obtained by using half rations (10 tons per acre) of barnyard manure with small quantities of phosphatic and nitrogenous fertilizers.

The soil of the unfertilized plat on one of the farms contained 0.126 per cent of phosphoric acid and 0.116 per cent of potash. The amounts soluble in a 1 per cent solution of citric acid were 0.0054 per cent of phosphoric acid and 0.0062 per cent of potash. This soil responded freely to phosphatic and potash fertilizers, as also to nitrogen. As compared with the unfertilized plat there was an increased yield of 13 tons per acre when a high grade superphosphate was applied, 14 tons when superphosphate and nitrate of soda were used, and 19 tons when superphosphate, nitrate of soda, and sulphate of potash were applied.

Jerusalem artichokes, turnips, and mangel-wurzels, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 24–28*).—These crops were grown as food for hogs. At Newport Jerusalem artichokes were planted 36 by 18 in. apart and the yield was 453¾ bu. per acre; at Fayetteville the distance was 3 by 3 ft. and the yield 612 bu. per acre. Nineteen varieties of turnips were grown. The test of mangel-wurzels was unsatisfactory. Food analyses of artichokes, sweet potatoes, mangel-wurzels, and turnips are given.

Experiments at Borsbeke-lez-Alost (Belgium), P. DE VUYST (*Rev. Agron. Louvain, 3 (1894), No. 4, pp. 251–286*).—These consisted of fertilizer experiments and variety tests on potatoes, oats, carrots, parsnips, and turnips, and culture experiments with potatoes, maize, and roots.

In experiments with beets, wheat, and potatoes the plats submitted to an electric current produced by a zinc and copper couple afforded smaller yields than the check plats. With potatoes the application of nitrate of soda at planting time and during cultivation gave practically the same results. The continued selection of seed potatoes during 3 years by planting those which had the highest percentage of starch, as shown by their sinking in brine, increased the yield 6.5 per cent and raised the percentage of starch in the crop.

On beets the nitrogen of nitrate of soda was more effective than that of sulphate of ammonia. Nitric nitrogen applied at planting afforded a larger yield than an intercultural application. Kainit was of less value on carrots than on parsnips.

Fertilizer experiments with cereals and potatoes at the Swedish Agricultural College, 1892–'93, S. RHODIN (*Kgl. Landt. Akad.*

Handl. Tidskr., 33 (1894), pp. 297–312, 372–384).—Nitrate of soda vs. fish guano for spring wheat and for oats.—The following are the average yields with the different applications of fertilizers:

Yield of wheat and oats with nitrate of soda and fish guano.

Fertilizer.	Nitrogen per hectare.	Time of application of fertilizers.	Yield per hectare.	
			Grain.	Straw.
Spring wheat.	*Kg.*		*Kg.*	*Kg.*
Nothing	0		2,451.0	4,742.0
Nitrate of soda	50.00	At sowing time	2,780.5	6,330.0
Do	50.00	At germination	2,953.7	5,796.2
Do	50.00	½ at germination ½ at heading	3,025.0	4,912.5
Fish guano	33.75	Preceding fall	2,641.0	5,508.0
Do	50.00	do	2,643.7	5,218.7
Oats.				
Nothing	0		2,608.5	4,888.0
Nitrate of soda	33.75	At sowing time	3,137.5	5,833.0
Do	33.75	At germination	2,923.5	5,633.0
Do	33.75	½ at germination ½ at heading	2,731.5	5,810.0
Fish guano	33.75	Preceding fall	2,808.3	5,045.0
Do	50.00	do	2,833.3	5,223.0

The best time for applying nitrate of soda to spring wheat was at the time of germination or half at this time and half when the wheat was heading. In case of the oats, on the other hand, the best results were obtained by applying the fertilizer at time of sowing.

Barnyard manure vs. poudrette for winter wheat and other crops.—Beginning in 1891 straw-litter manure and peat-litter manure were compared with peat poudrette as fertilizers for winter wheat. In 1892 ruta-bagas were planted on plats 148.5 square meters in area, the barnyard manure being applied at the rate of approximately 40,000 kg. per hectare, and the poudrette at the rate of 15,000 kg. The poudrette used contained 74.70 per cent of water, 0.86 per cent of nitrogen, 0.45 per cent of phosphoric acid, and 0.44 per cent of potash. The yield of ruta-bagas per hectare was:

	Kilograms.
With straw-litter manure	41,073
With peat-litter manure	43,875
With peat poudrette	43,807

The yield was smallest with straw-litter manure, as it was also in 1891. The residual effect of the 3 kinds of manure was studied during 1893, barley being sown without fertilizers on the plats used in the preceding year's experiments. The yield of barley per hectare was as follows:

Residual effect of manures on yield per acre of barley.

Kind of fertilizer applied to the preceding crop.	Grain.	Straw.
	Kg.	*Kg.*
Straw-litter manure	3,663	5,855
Peat-litter manure	3,880	5,788
Peat poudrette	3,930	5,183

The results of 3 years' experiments show that even for heavy clay the peat-litter manure is superior to straw-litter manure.

Poudrette and nitrate of soda for various crops.—The effect of 3 kinds of poudrette on the yields of hay and of potatoes and on the starch content of the latter was studied in 1892 and 1893. The composition of the poudrette applied was as follows:

Analyses of poudrette.

	Water.	Total nitrogen.	Phosphoric acid.	Potash.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Peat poudrette	70.70	0.86	0.40	0.44
"Riddersirk" poudrette	77.25	1.10	.74	.40
"Concentrated peat poudrette"	49.57	1.68	2.04	1.51

Only "Riddersirk" poudrette increased the yield of hay sufficiently to be profitable.

In 1893 the different kinds of poudrettes and nitrate of soda were compared on potatoes. As in 1892, like money values of the different fertilizers were applied. The soil was a sandy clay. The fertilizers were applied directly before planting the potatoes. The results follow:

Starch content and yield of potatoes.

Fertilizer.	Starch content.	Yield per hectare.	
		Tubers.	Starch.
	Per cent.	*Kg.*	*Kg.*
None	13.43	21,800	2,918
Peat poudrette	13.60	24,025	3,255
"Riddersirk" poudrette	13.66	24,650	3,360
"Concentrated peat poudrette"	13.80	21,000	2,905
Nitrate of soda	11.50	20,925	2,406

The low percentages of starch obtained are explained by the lack of rain in the early vegetation period, the low summer temperature, and the lack of heat and light during the month of September.

The decrease in the starch content of the potatoes receiving nitrate of soda is contrary to the experience of Stutzer, who states that the quality of potatoes is not appreciably lowered by applications of this fertilizer, and that the increase in yield is large, especially in dry seasons.

The effect of peat poudrette and nitrate of soda on barley was studied during 1893, equal money values of both fertilizers being applied. Every plat received Thomas slag at the rate of 80 kg. per hectare. The average results obtained were as follows:

Yield of barley with peat poudrette and nitrate of soda.

Fertilizer.	Yield per hectare.	
	Grain.	Straw and chaff.
	Kg.	*Kg.*
No nitrogenous fertilizer	2,433.0	6,176.5
Peat poudrette, spring 1893	3,139.0	8,037.0
Peat poudrette, fall 1892	2,627.0	6,742.5
Nitrate of soda	3,429.0	8,768.5

Phosphatic slag for potatoes.—The effect of 3 kinds of phosphatic slag on potatoes was investigated during 1893. "Finshytte" slag is made from ferruginous Gellivara apatite and is named after the place of manufacture. Martin's slag is obtained by treatment of Gellivara iron ore in the Martin process. These 2 slags contained 10.94 per cent and 17.83 per cent of phosphoric acid, respectively, while the Thomas slag applied contained 18.54 per cent of this ingredient. The plats were fertilized in the fall of 1892 at the rate of 100 kg. of potash per acre, in the form of sulphate, and 120 kg. of phosphoric acid in the different phosphatic slags; 2 plats received only potassium sulphate.

The average results for the duplicate plats were as follows:

The starch content and yield of potatoes.

Fertilizer per hectare.	Starch content.	Yield per hectare.	
		Tubers.	Starch.
	Per cent.	*Kg.*	*Kg.*
100 kg. sulphate of potash	13.1	10,941	1,433.27
100 kg. sulphate of potash 120 kg. phosphoric acid in Thomas slag	12.8	13,815	1,768.32
100 kg. sulphate of potash 120 kg. phosphoric acid in Martin's slag	12.5	14,648	1,831.00
100 kg. sulphate of potash 120 kg. phosphoric acid in Finshytte slag	11.9	11,471	1,365.04

Lemström's frost torches (E. S. R., 5, pp. 660–662) were used with marked success in the preceding experiments for preventing frost on the potatoes during several nights in the month of August. In the opinion of the author the Lemström peat frost torches are the most convenient, effective, and inexpensive combustive material for the generation of smoke as a preventive of damage from frost. The expense of torches is exceedingly small compared with the value of the crops in danger. Less than 100 torches are required per acre of land, the cost of which in the European market is given as 64 cts.—F. W. WOLL.

Rotation of crops, J. B. LAWES and J. H. GILBERT (*Jour. Roy. Agr. Soc. England, 3d ser., 5 (1894), No. 20, pp. 585–646*).—This is a comprehensive discussion of the results of rotation experiments at Rothamsted, England, begun in 1848. The four-course rotation consisted of (1) Swedish turnips (ruta-bagas), (2) barley, (3) clover (or beans) or bare fallow, and (4) wheat. One section of the field has received no fertilizers since the experiments began. On the other two sections fertilizers were applied only to the root crop, hence only once in 4 years. In the second section minerals only were used, superphosphate alone being applied in the first 9 courses (36 years), supplemented in succeeding courses by salts of potash, soda, and magnesia. The third section of the field received a complete fertilizer, supplying, in addition to minerals, 140 lbs. of nitrogen every fourth year, equivalent to an average annual application of 35 lbs. per acre. This complete fertilizer consisted of superphosphate, salts of potash, soda, and magnesia, and rape cake.

In each section the turnips on half the area devoted to this crop were fed on the land; on the other half both roots and leaves were permanently removed.

Crop yields under different conditions.—The turnip crop, sometimes regarded as a restorative crop, gave practically no yield without fertilizers. Superphosphate largely increased the yield, a result regarded as largely due to its increasing the growth of feeding roots in the surface soil, and thus enabling the turnip crop to quite completely exhaust the nitrogen previously accumulated in the soil. Hence soil fertility is very rapidly exhausted by growing and removing a turnip crop fertilized with superphosphate alone.

The addition of nitrogen to the mineral fertilizer practically doubled the yield obtained from superphosphate.

On the unmanured section the crop of turnips was so small that it mattered little, as shown by subsequent crops, whether it was removed or retained. On the section treated with superphosphate, feeding turnips on the land increased the yield, and the advantage of this practice was still more marked on the more productive area supplied with a complete fertilizer. The yield of turnips was practically identical whether the field was fallowed or in a leguminous crop 2 years previous.

Barley, the second crop of the course, suffered less from the absence of fertilizers than did turnips, the average yield of the unfertilized section being more than 30 bu. per acre. This was attributed to the thorough preparation for barley, viz, the clean cultivation of turnips, and to the slight draft made on the soil by the small (unfertilized) turnip crop. Naturally the removal or retention of the small turnip crop did not affect the yield of barley. On the plats on which turnips treated with superphosphate had yielded fairly well, the feeding of the turnips on the land considerably increased the yield of barley. However, on the section thus manured the removal of the turnip crop so far exhausted the soil as to reduce the yield of barley below the yield on the unfertilized section. A complete fertilizer applied to the preceding turnip crop largely increased the yield of barley, especially on the plats on which the heavy turnip crop had been fed.

Clover was intended to be the third crop of every course, but repeated failures of this crop led to the frequent substitution of beans in its stead. Thus in the 11 courses clover was grown only 4 times, beans 7 times. The yield of clover without manure averaged 3,000 lbs. per acre, which amount was doubled by superphosphate or mixed minerals, and raised to 6,800 lbs. when a complete fertilizer was applied to the turnip crop 2 years previous. The action of these fertilizers on beans was somewhat similar. Both beans and clover yielded better on plats where the turnip crop grown 2 years before had been fed on the land than on the plats whence it had been removed.

Both mixed minerals and a complete fertilizer applied to turnips increased the yield of wheat in the fourth year after the application. The retention of the turnips somewhat increased the yield of wheat in the fourth year thereafter.

On the unfertilized section and on that which had received minerals alone, on both of which there was soil exhaustion, especially of nitrogen, the wheat crop was somewhat larger after bare fallow than after the leguminous crop which had been removed. On the other hand, the section kept in a high state of fertility by the application of a complete fertilizer to turnips, and thus capacitated for a luxuriant growth of beans or clover (having a heavy crop residue), afforded larger returns in wheat when this latter crop followed a leguminous crop than when it was preceded by bare fallow. Thus on fertile soil the advantage of growing a leguminous crop instead of fallowing consisted not only in the value of the leguminous crop, but also in a slight increase in the wheat crop. Subsequent turnip crops showed no marked difference between the plats fallowed or bearing a leguminous crop 2 years previous.

Amounts of dry matter contained in the crops.—The amount of dry matter, nitrogen, ash, phosphoric acid, and potash in turnips, barley, clover and beans, and wheat, in rotation and in continuous culture, are tabulated and discussed.

The dry matter in turnips grown without fertilizer was practically identical in rotation and in continuous culture, due to the failure of the unfertilized crop grown under both conditions. When fertilized, the turnip yielded more in rotation than in continuous culture.

On the unfertilized section the grain and straw of barley grown continuously contained only about three fifths as much dry matter as in rotation, and on the mixed mineral section considerably less than in rotation. Especially marked was the difference in favor of rotation on the area where turnips had been fed. On the section supplied with a complete fertilizer continuous culture gave best results when the turnip crop of the rotation was removed, but rotation excelled when the turnips were fed.

Under all conditions of manuring beans grown continuously yielded only about half as much as when grown in rotation. A similar comparison could not be made for clover, because the crop failed so frequently.

In the wheat crop the dry matter obtained by continuous culture was, on the unfertilized section and on that receiving superphosphate alone, less than half as much, and on the section treated with a complete fertilizer, considerably less than that secured in rotation.

Amounts of nitrogen contained in the crops.—Only an inconsiderable amount of nitrogen was contained in turnips not fertilized. The amount was increased twofold to fourfold under the influence of phosphatic fertilizers alone, which induced the growth of numerous fibrous feeding roots. With a complete fertilizer the amount of nitrogen in the crop was greatly increased in both systems of culture. The large turnip crops obtained by the aid of nitrogenous manures on land which for about fifty years had received no carbonaceous application indicates that the atmosphere is "the chief, if not the exclusive, source of the carbon of the crops."

The nitrogen taken up by barley on the superphosphate section and on the unfertilized plat was considerably greater in rotation than in continuous culture. With a complete fertilizer barley in rotation took up less nitrogen on the plats from which the turnip crop had been removed than in continuous culture. Under all conditions of manuring, about 75 per cent of the nitrogen of the barley crop was contained in the grain.

Beans in rotation took up more than twice as much nitrogen as in continuous culture. In rotation the amounts were 36 lbs. per acre per annum on the unfertilized section, 40 to 50 lbs. with superphosphate, and 63.6 to 70.2 lbs. with a complete fertilizer. Under all conditions clover took up much more nitrogen than beans—without manure, 47 to 55 lbs.; with superphosphate alone, 124.5 to 144.6 lbs.; with a complete fertilizer 167 to 168.4 lbs. per acre. Of the nitrogen in the bean crop (beans and straw) at least 75 per cent was in the beans.

Wheat under all conditions of fertilization utilized more nitrogen in rotation than in continuous culture. Continuous culture gave more nearly equal results when a complete fertilizer was employed. Under all conditions the grain stored up more than twice as much nitrogen as the straw.

Amounts of phosphoric acid in the crops.—Only about half as much phosphoric acid was taken up by the turnip crop in continuous culture as in rotation, due to the unfavorable mechanical effects of the former system by which the total crop was reduced. In rotation and when well fertilized, 5 to 6 times as much phosphoric acid was accumulated in the roots as in the leaves.

Without fertilizers and also with superphosphate, barley took up much more phosphoric acid in rotation than in continuous culture; with a complete fertilizer the two systems of culture gave equal results when turnips were fed on the land, but when removed the rotation crops stored up less phosphoric acid than those under continuous culture.

Clover and beans under all conditions of manuring took up much more phosphoric acid in rotation than in continuous culture. Without fertilizers clover utilized but little more of this ingredient than beans; with superphosphate more than twice as much; and with a complete fertilizer still more. The draft of phosphoric acid was less with the leguminous crops than with the cereals.

Wheat, like barley, took up more phosphoric acid in rotation than in continuous culture. Without fertilizers and also with superphosphates about four fifths of this ingredient was stored in the grain. However, with a complete fertilizer, inducing luxuriant growth, the grain contained only about half the phosphoric acid, the rest being stored in the straw.

Amounts of potash in the crops.—The authors have shown elsewhere that root crops are essentially sugar crops, and that the presence of considerable potash is an important condition in the formation within plants of carbohydrates and especially of sugar. Most of the potash of the turnip crop was found in the roots and this proportion increased with the yield of the crop, the bulk of the potash and sugar being stored in the same part of the plant.

In turnip roots and leaves on the rotation plats, unfertilized, the amount of potash per acre was 4 to 6 lbs.; on the superphosphate plat 25 to 28 lbs., due to the increased feeding capacity resulting from phosphatic fertilizer; and on the area receiving a complete fertilizer 80 lbs. Less potash was utilized in continuous culture than in rotation.

In barley the greater portion of the potash was found in the straw. The amount of potash in the straw was subject to great fluctuations, depending on the supply in the soil and fertilizer, while that in the grain bore a fairly uniform relation to the dry matter.

Without fertilizers and with superphosphate the amounts of potash in the barley crop were not widely different, but with a complete fertilizer the quantity was largely increased. With a complete fertilizer and on a rotation plat from which the root crop had not been removed, the potash in rotation and in continuous culture crops was practically identical.

Beans took up about twice as much potash in rotation as in continuous culture. Without fertilizer and with superphosphate alone the quantaties of potash were practically the same, but with a complete fertilizer these amounts were doubled. Compared with beans grown under parallel conditions clover utilized much more potash; without fertilization, 3 times as much (30 lbs. per acre); with superphosphate alone, more than 5 times as much (57.6 to 65.5 lbs. per acre); and with a complete fertilizer, also more than 5 times as much (123.1 to 132.6 lbs. per acre).

The beneficial effect on clover of superphosphate used alone appeared to be closely connected with the increased capacity thereby conferred on clover of taking up larger quantities of the potash of the soil. In beans more than two thirds of the total potash was found in the seed.

Wheat in rotation took up much more potash than in continuous culture. As with barley, the greater part of the potash was found in the straw, which also contained the bulk of the carbohydrates in the form of cellulose.

The conclusion that phosphoric acid is specially concerned in the formation of the nitrogenous bodies and that potash is likewise related to the non-nitrogenous compounds, though regarded as well founded by the authors, offers only an imperfect explanation of the functions of these mineral constitutents.

Of all the crops of the four-course rotation the leguminous crops take up the most lime, clover sometimes utilizing more than all the other crops of the rotation taken collectively.

Experiments with varieties of barley, N. WESTERMEIER (*Deut. landw. Presse, 22 (1895), No. 22, pp. 198, 199*).

Coffee cultivation at the Gold Coast (Africa) (*Kew Misc. Bul. 98, 1895, pp. 21–23*).

Cotton, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 23, 24*).—Brief general statements are made as to Egyptian varieties, crosses of American and Egyptian varieties, and American varieties.

Cowpeas, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 11–16*).—Notes on 7 varieties and directions for cultivation are given. The Unknown pea is regarded as the best variety for green manuring and as superior to any of the running varieties for hay. Late planting afforded a growth of vines more nearly upright and a larger yield of peas than early planting.

Lathyrus fodder (*Kew Misc. Bul. 94, pp. 349–353*).

The flat pea (Lathyrus sylvestris), J. SAMEK (*Tirol. landw. Blätter, 14 (1895), No. 1, pp. 1–3*).

The care of meadows, ANDREÆ (*Ztschr. landw. Ver. Hessen, 1895, No. 11, pp. 82, 83*).

Fertilizer experiments on meadows (*Landbote, 16 (1895), No. 6, pp. 41, 42*).

Experiments with varieties of oats and potatoes and experiments in liming the soil, J. NEUMANN (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 3, pp. 41–43*).

Experiments with varieties of potatoes, C. VIBRAUS (*Deut. landw. Presse, 22 (1895), No. 21, pp. 189, 190*).

Experiments with varieties of potatoes (*Chron. Agr. Canton Vaud, 8 (1895), No. 5, pp. 106–111; No. 6, pp. 138–141*).

A test for the quality of potatoes, L. R. TAFT (*Garden and Forest, 8 (1895), pp. 155, 156*).

The sorghums for forage and grain, F. C. BURTIS (*Rpt. Kans. Bd. Agr., 1895, Mar. 31, pp. 159–166*).

Sugar beets in 1893, E. E. SLOSSON (*Wyoming Sta. Rpt. 1894, pp. 16–23*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 38).

Experiments with varieties of spring wheat, WESTERMEIER (*Deut. landw. Presse, 22 (1895), No. 25, p. 233*).

Cost and profit of growing wheat, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, pp. 14, 15*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 44).

On the decortication of wheat, BALLAND (*Compt. Rend., 120 (1895), No. 11, pp. 638–640*).

Industrial plants (Les plantes industrielles, IV), G. HEUZÈ (*Paris*).—This volume is chiefly occupied with tobacco and other narcotic plants, sugar-producing plants, gum-producing plants, medicinal plants, and tea and coffee.

Crop report for 1893, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, pp. 3–13*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 44).

The system and methods practiced at the station farm, R. J. REDDING (*Georgia Sta. Bul. 27, pp. 211–215*).—This is a general statement of the methods of rotation, fertilization, planting, and cultivation practiced on the station farm.

HORTICULTURE.

Tests of plums, apricots, and Japanese persimmons, R. H. PRICE (*Texas Sta. Bul. 32, pp. 473–496, figs. 13*).—This bulletin is chiefly devoted to comparative investigations as to the value of different varieties of plums in Texas. The varieties are arranged according to the natural classification of the species from which they have originated. Descriptive notes are given for 19 varieties of the Chickasaw group (*Prunus angustifolia*), 8 of the Wild Goose group (*P. hortulana*), 5 of the American group (*P. americana*), 9 of the European varieties (*P. domestica*), and 17 of the Japan group (*P. triflora*). In addition 8 unclassified varieties were tested, as were also *Prunus pissardii*, *P. simonii*, and the Utah hybrid dwarf cherry. Over 20 varieties of plums are stated to have originated in Texas, most of them belonging to the Chickasaw group, which succeeds better in the State than the Wild Goose or American groups of varieties, being more productive and freer from insect and fungus injuries. The following varieties are recommended: Caddo Chief, Lone Star, Marianna, Munson, Newman, Paris Belle, Robinson, and Transparent. The European varieties were not satisfactory, but the Japanese plums proved successful, although requiring spraying. Of them Abundance, Burbank, Douglas, Georgeson, Kelsey, and Norman are regarded as promising.

A table is given showing the dates of blooming and ripening of 67 varieties. Experiments were made with the Marianna plum to ascertain its value as a stock for budding, and several nurserymen were questioned in regard to this point. The conclusion arrived at is that the Marianna does not do well as a stock for all varieties, especially on dry uplands.

Brief notes are given on the curculio (*Conotrachelus nenuphar*) and leaf-footed bug (*Leptoglossus phyllopus*), and on the leaf blight, brown rot, and shot-hole fungus. Spraying the trees with 3 oz. of London purple mixed with 25 gal. of Bordeaux mixture is believed to prevent injury by nearly all injurious insects and fungus diseases.

Varieties of 2 species of apricots were tested, 4 varieties of the Chinese or Japanese apricot (*Prunus mume*) and 8 of the common and Russian apricots (*P. armeniaca*) being grown. Myer Early and Royal were most promising.

Ten varieties of the Japanese persimmon (*Diospyros kaki*) were tested, and Hachiya, Tane-Nashi, and Zengi are recommended.

The quince in western New York, L. H. BAILEY (*New York Cornell Sta. Bul. 80, pp. 609–631*).

Synopsis.—General and more detailed directions for the care of quince orchards, with remarks on the choicer varieties and notes on insect and fungus enemies.

This bulletin deals with the quince industry in general and particularly in western New York, where the fruit is more extensively grown than elsewhere. Some of the large and successful orchards in the

State are mentioned and compared with others where careless cultivation makes the crop almost a failure. A heavy, moist clay loam, rendered friable by good cultivation, fertilizing, and draining, is considered to be the best soil for quinces, although they thrive upon lighter lands, where, however, they are shorter lived. In the way of fertilizers, 200 to 300 lbs. of muriate of potash per acre, applied broadcast and harrowed in, is advised, supplemented by 200 to 500 lbs. per acre of phosphoric acid in bone compounds or dissolved South Carolina rock. It is believed that the requisite nitrogen can be supplied by tillage, green manures, and barnyard manure. The common idea that salt is an indispensable quince fertilizer is believed to be erroneous.

Clean culture is strongly urged, and illustrations are given showing the difference in appearance between orchards allowed to run to sod and others where the ground is kept well stirred by shallow tillage. It is advised that sodded orchards be broken up by thorough harrowing in the spring.

Quinces are propagated by cuttings, stooling, apple-root grafting, and budding on quince stocks. Both of the latter methods are recommended, though budding seems to be preferred, the stock being the Angers quince imported from Europe. It is advised that quinces be planted 15 ft. apart each way to allow a sufficient growth to the trees and permit spraying. The top should be started 20 in. or less above the ground and the branches allowed to spread rapidly. Each winter it is recommended to shorten in the annual growth. By this means the fruit is thinned, for the terminal blooms are removed and the crop is borne on the side spurs, being also less liable to injury from winds.

Quince trees begin to bear when 5 or 6 years old and reach their full productiveness when 9 or 10 years planted. An average crop is 1 bu. of good fruit to a tree, but this yield may be even doubled occasionally. Care in picking and packing the crop is urged to avoid bruising and to secure a better appearance of the product.

The 4 leading varieties are Orange, Champion, Rea, and Meech, of which Orange is the most widely known and grown, although Champion has proved the most productive. Illustrated descriptions are given of these varieties. The Chinese or Hong Kong quince (*Pyrus cathayensis*) is mentioned, the fruit being large, often exceeding 2 lbs.

Descriptive notes and treatment are given for leaf blight and spot (*Entomosporium maculatum*), rust (*Rœstelia aurantiaca*), pear blight or fire blight, borer, codling moth, and quince curculio. For the first 2 diseases spraying with Bordeaux mixture is recommended, and experiments are cited showing its beneficial result. Pear blight is regarded as the most serious disease, and can only be treated by cutting off and burning all affected limbs. Digging out the borers, spraying for the codling moth with Paris green, and jarring the curculios on to sheets is advised.

Experiments with fruits and fruit trees, E. S. RICHMAN (*Utah Sta. Bul. 37, pp. 1–10*).—Descriptive notes on various varieties of strawberries, grapes, peaches, apricots, cherries, plums, pears, and apples grown on the station grounds. Notes are given on 14 varieties of strawberries, and Parker Earle, Sharpless, and Thompson No. 7 are recommended. Of the 17 varieties of grapes mentioned Concord, Delaware, Early Victor, and Massasoit are especially advised for planting in Utah. Thirteen varieties of peaches were tested, of which 5 proved to be too late. The early varieties, such as Early Rivers and Early St. John are recommended. The Russian apricots, of which 3 varieties were grown, proved constant and heavy bearers, but produced small fruit, and consequently are not considered so desirable as other larger varieties. On account of their hardiness, however, they are preferred to the larger tenderer varieties of the common apricot. Twelve varieties of cherries were grown, and the sour cherries, such as Mt. Large and Early Richmond, were found to thrive better than sweet cherries, which were not perfectly hardy.

Brief remarks are made on an experiment in giving young orchards different kinds of treatment, alfalfa, clover, timothy, and a mixture of timothy and clover being sown on 4 different plats. As a result after 3 years of this treatment the majority of the trees are dead, while check trees planted on well cultivated land are living and doing well.

Varieties of the strawberry, L. H. BAILEY (*New York Cornell Sta. Bul. 79, pp. 583–600, figs. 9, pl. 1*).—This bulletin consists of a tabulation of the replies received from 110 correspondents throughout the State in regard to the different varieties grown in their sections. The Wilson strawberry still appears to be the leading variety for general cultivation, followed by Crescent, Bubach, Haverland, Warfield, and Parker Earle. Each important strawberry center has its own list of favorites, varying according to locality; in Oswego County, for example, Parker Earle and Bubach are preferred to Wilson and Crescent. The most popular early variety is Michel, with Crescent ranking second. Parker Earle and Gandy are recommended as late berries. The Crescent is considered the most productive variety, with Wilson and Warfield ranking second and third. As shippers, Wilson, Parker Earle, and Warfield received the greatest number of votes. In regard to the best berry for home use 31 varieties are mentioned by 101 correspondents, Bubach, Crescent, Jessie, and Wilson receiving the most votes for this honor. In all 52 varieties are recommended, but the most prominent are Wilson, Crescent, Bubach, Haverland, Parker Earle, Warfield, Michel, Gandy, and Jessie.

Strawberries and grapes, M. J. HUFFINGTON (*Colorado Sta. Bul. 29, pp. 24*).—Cultural directions for strawberries and grapes, with comparative notes and tabulated data for the varieties grown on the station grounds. For strawberries light or sandy soils are regarded as giving earlier fruit, while the crop is generally heavier on land possessing some clay. Irrigation is advised in some cases, and potash fertilizers and well-rotted barnyard manure are recommended. The yield of fruit was increased by nitrate of soda applied as a top dressing early in the spring. Mulching is regarded as advantageous because, besides protecting the plants during the winter, it retards their growth in the spring, and thereby lessens the chances of their being killed by late frosts. Thirty-eight varieties were tested, and the dates of blooming and ripening are given. Michel Early is recommended as a desirable extra early berry, while the most attractive berry in appearance and flavor was Edward Favorite. For market varieties are recommended Warfield, Parker Earle, Edward Favorite, Boynton, and Woolverton.

For grapes a warm, well-drained soil, sloping toward the south, is recommended, the vines to be set out in the spring in holes filled in with rich fertilizing substances. Pruning and training on trellises after the fan system is advised, each year trimming down the horizontal shoots to 1 or 2 good buds each. Notes are given for 22 black, 13 red, and 13 white varieties, and the following varieties, in the order of ripening, are recommended for the northern and eastern portions of the State: *Black*—Champion, Moore Early, August Giant, Oriental, Worden; *red*—Brighton, Norfolk, Delaware, Agawam; *white*—Eldorado, Moore Diamond, Martha, Lady Washington.

Asparagus growing, T. V. MUNSON (*Amer. Hort., 5 (1895), No. 2, p. 20*).—A short note on preferred methods.

Experiments toward the protection and improving of asparagus culture (*Ztschr. landw. Ver. Hessen, 1895, No. 4, pp. 27, 28, figs. 3*).

Asparagus culture on a large scale (*Tirol. landw. Blätter, 14 (1895), No. 5, pp. 44–46*).

Sweet potatoes, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 16–19*).—The Yellow Yam and Vineless were tested at Newport and at Camden. As a food for hogs the Vineless was preferred. Directions for the cultivation of sweet potatoes are given.

Garden vegetables and tobacco, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, pp. 24–30*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 133).

The Vitis æstivalis group of wine grapes, F. A. WAUGH (*Amer. Hort., 5 (1895), No. 2, pp. 18–20, figs. 2*).—Descriptive and comparative notes on some of the leading varieties of this group, Herman Jaeger, Jaquez, Norton Virginia, Herbemont, and Cynthiana being figured. The last two are considered especially valuable for wine.

The fertilizing constituents removed from the soil in wine, A. MÜNTZ (*Jour. Agr. Prat., 59 (1895), No. 13, pp. 472, 473*).

Chestnuts, W. A. TAYLOR (*Amer. Hort., 5 (1895), No. 2, pp. 28, 29*).—The Spanish and Japanese varieties are compared with the native chestnuts, and considered of inferior quality. Grafting the imported varieties on to American stocks is advised and further developing of choice varieties urged.

Notes on agriculture, B. D. HALSTED (*Science, n. ser., 1 (1895), No. 14, pp. 376–378, fig. 1*).—Notes are given on electro-horticulture, soil treatment of orchards for drought, Russian thistle, and beet leaf spot and its remedies.

Progress report on fruits and trees, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, pp. 31–34*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 55).

FORESTRY.

Osier culture, P. MOUILLEFERT (*Prog. Agr. et Vit., 12 (1895), No. 7, pp. 173–179*).

The bull pine in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), pp. 163, 164*).—Notes are given of *Pinus ponderosa,* showing its adaptability for planting in the Western States.

The Scotch pine in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 142*).—The author states that where this tree has survived the first year no conifer gives better results in the West where tried than this one.

The white pine in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 132*).

Pinus banksiana in the Nebraska sand hills, C. A. KEFFER (*Garden and Forest, 8 (1895), pp. 152, 153*).—A favorable report is given of experiments to grow this tree in the sand hills of western Nebraska.

Trees of minor importance for western planting, C. A. KEFFER (*Garden and Forest, 8 (1895), pp. 122, 123*).—Notes are given on ailanthus, Kentucky coffee trees, Russian poplars, and willows, sycamore, basswood or linn, plums, and choke and sand cherries.

Forestry and the abandoned farm, C. S. PLUMB (*Garden and Forest, 8 (1895), p. 162*).

Forestry at Michigan Agricultural College, W. J. BEAL (*Garden and Forest, 8 (1895), pp. 148, 149*).

Ornamental, forest, and shade trees, E. S. RICHMAN (*Utah Sta. Bul. 37, pp. 11, 12*).—Note on the trees growing at the station, the poplars being recommended as the most promising for general forestry purposes, while it is believed that the growing of some of the hard-wood trees, such as the black and white walnuts and ash, can probably be made profitable.

Forest trees, B. C. BUFFUM (*Wyoming Sta. Rpt. 1894, pp. 34, 35*).—A reprint from Bulletin 17 of the station (E. S. R., 6, p. 56).

SEEDS—WEEDS.

Further studies of the weed seeds found in American clover seed, O. BURCHARD (*Landw. Vers. Stat., 45 (1895), No. 5 and 6, pp. 469–476, tables 2*).—This article is a continuation of a previous paper[1] of the author on the origin of American clover seed as determined by the accompanying weed seeds. In the present article detailed descriptions are given of what the author considers some of the more characteristic weed seeds found in clover seed imported from this country. The following are described and most of them are illustrated by means of photogravures: *Teucrium canadense, Euphorbia preslii, Phacelia tanacetifolia, Paspalum læve, P. ciliatifolium, Solanaceæ "E," Euphorbia "D," Tiliaceæ "A," Hyoscris scabra, Hedeoma pulegeoides,* and *Plantago hookeriana* [probably *P. aristata*].

Effect of alkaloids on the germination and development of seeds, M. MOSSO (*Arch. ital. Biol., vol. 21, p. 231; abs. in Chem. Ztg., 18 (1894), No. 102, Repert., p. 328*).—The author made an investigation of the effect of various alkaloids on the germination and growth of seeds of *Phaseolus multiflorus.* The following were used in solutions of 0.0001, 0.0005, 0.001, 0.005, 0.01, 0.05, 0.1, 0.5, 1, and 2 gm. in 100 cc. distilled water: Morphin, nicotin, cocain hydrochlorate, strychnin, atropin sulphate, and caffein salicylate. The experiment was conducted for 18 days, and comparisons were made with equal lots of seed soaked with water. It was found that cocain and atropin 0.01 per cent, strychnin 0.05 per cent, morphin 0.001, and atropin 0.0005 hastened germination, while the more concentrated strengths delayed it. For the caffein no accelerated results were secured, due, in the author's opinion, to the action of the salicylic acid. The author believes that alkaloids will have a narcotic or stimulating effect on plants as well as on animals according to the dose.

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[1] Landw. Vers. Stat., 43 (1893), No. 3 and 4, p. 239 (E. S. R., 5, p. 911).

The influence of certain salts on germination, A. BRUTTINI (*Staz. Sper. Agr. Ital., 27 (1894), p. 30; abs. in Chem. Ztg., 18 (1894), No. 102, Repert., p. 328*).—The author conducted experiments on wheat with 1 and 2 per cent solutions of the substances mentioned below, the seed being soaked for 24 hours prior to planting. Each lot contained 15 seeds, and at the end of 4 days the following germinations were shown:

Germination of wheat treated with various salts.

Kind of salt.	Number of seed germinated.		Kind of salt.	Number of seed germinated.	
	2 per cent.	1 per cent.		2 per cent.	1 per cent.
Mercuric chlorid	0	0	Potassium sulphocyanid	10	14
Ferric chlorid	0	2	Uranium nitrate	10	13
Platinum chlorid	3	6	Cobalt chlorid	11	14
Potassium cyanid	4	6	Potassium phosphate	12	14
Copper nitrate	5	6	Potassium ferrocyanid	12	13
Manganese phosphate	5	7	Sodium chlorid	12	13
Barium permanganate	6	8	Calcium chlorid	12	15
Nickel chlorid	6	9	Potassium permanganate	13	14
Ammonium chlorid	7	12	Barium chlorid	13	13
Ammonium sulphocyanid	8	12	Potassium nitrate	15	15
Copper sulphate	9	13	Distilled water	15	15
Potassium ferricyanid	9	13			

The germination of seed, WERNICKE (*Ztschr. landw. Ver. Hessen, 1895, No. 8, pp. 57, 58*).—The author experimented with various seeds which, owing to their thick or nearly impervious seed coats, are usually very slow in germinating. The ones experimented upon were *Acacia molissima* and *Lathyrus* spp. particularly *L. sylvestris wagneri*. He subjected them to hot water for various times, after which the seeds were planted in sand in flower pots. Seeds without any treatment gave 50 per cent germination, those soaked for 6 hours in water at 122° F. gave 60 per cent, those soaked for 3 hours at 167° F. gave 72 per cent, and those treated for an hour with water heated from 204 to 212° F. gave 92 per cent germination.

Squirrel-tail grass, A. NELSON (*Wyoming Sta. Rpt. 1894, pp. 73-79, pls. 4, fig. 1*).—A reprint of Bulletin 19 of the station (E. S. R., 6, p. 640).

DISEASES OF PLANTS.

Some fungus diseases of beets, B. D. HALSTED (*New Jersey Stas. Bul. 107, pp. 13, figs. 5*).

Synopsis.—The author reports upon beet scab, root rot of beets, leaf spot, beet rust, white rust, and downy mildew.

Beet scab (pp. 3, 4).—The identity of the scab of beets and potatoes[1] is mentioned, and the necessity of avoiding the planting of one crop where a diseased crop of the other has previously grown.

Root rot of beets (pp. 4–6).—While examining a store pit of beets a fungus was obtained which affected the roots, causing them to be slightly shrunken and almost coal black in color, this discoloration sometimes extending fully to the center of the root. The surface or affected part was dotted with minute specks, which upon examination proved to be the pycnidia of a species of *Phyllosticta.* When placed in moist cloths and kept warm the young patches on the diseased roots soon develop the pycnidia in abundance. It was noticed that the fungus easily penetrates the cloth and develops the pycnidia on its upper surface; and this fact was taken advantage of by the author to secure, in a comparatively easy way, pure cultures of the fungus. Two years before a *Phyllosticta* was found upon the leaves of garden beets, and a comparison of the pycnidia taken from the roots in question and compared with those on the leaves showed that they are probably the same species. It was noticed that the beets in the storage pit in several instances still had adhering to them shreds of old leaves, and in some cases the patches of decay were located beneath such closely adhering leaves. Healthy roots obtained from a field where no *Phyllosticta* was found on the foliage were placed in a box and surrounded with fresh leaves obtained from a field at a considerable distance. In 10 days several diseased patches developed upon the surface of the beets and appeared the same as those previously studied. As the leaf is more susceptible to the disease than the root the author thinks a practical preventive of the spread of the disease to the root may be secured by exercising care in the removal of all foliage before roots are stored.

Beet leaf spot (pp. 7–11).—This is a leading fungus disease of the beet in New Jersey and is caused by *Cercospora beticola.* It seems to affect all varieties of the beet, and makes no distinction between the early and later planted ones. Its appearance upon the leaves is first noticed by the presence of small, light, ashy colored spots, which later often become holes by the disappearance of the tissue previously killed by the fungus. During the past season field experiments were made with fungicides for the prevention of this disease. The ones tested were Bordeaux mixture and ammoniacal copper carbonate, each being used in three strengths. The Bordeaux mixture full strength was made from freshly slacked lime and sulphate of copper, each 5 lbs., and water 25 gal., the other strengths being made by increasing the amount of water so as to make solutions of one half and one fourth strength. The ammoniacal copper compound for full strength consisted of 5 oz. of copper carbonate dissolved in 3 qt. of ammonia and 30 gal. of water. For the weaker solutions water was added to secure the one half and one fourth strength. The sprayings were begun on June 21, when the beets were 6 weeks old, and were continued at intervals of 10 days until 10 sprayings had been made. All the ammoniacal solutions were too strong, the foliage being burned wherever they were used.

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[1] North Dakota Bul. 4 (E. S. R., 3, p. 619).

The use of Bordeaux mixture caused so striking a difference in the plants as to be readily observed in passing the field. The untreated rows had small foliage, more upright and badly spotted leaves, while the sprayed plants showed a rank growth of leaves, nearly green throughout, with much less spot than the untreated plants. The usefulness of Bordeaux mixture as an insecticide was shown in one instance. The insects, which had been feeding on turnips, invaded the beet field, in some instances stripping the foliage of the untreated rows; those treated with Bordeaux mixture were left free. An increase of nearly 26 per cent in weight of plants was secured from the plants on which the Bordeaux mixture had been used, showing that the leaf spot of beet can in a large measure be controlled by the use of this fungicide.

Beet rust (p. 11).—The beet rust (*Uromyces betæ*) has not yet appeared in New Jersey, but the author gives a brief description of it and advises growers to be on the lookout for its appearance.

White rust of beets (p. 11).—This disease, caused by *Cystopus blitii*, is mentioned as a possible enemy. Probably the same fungus is not uncommon upon various weeds, *Amarantus* and the *Blitum*, spp.; and such weeds should be destroyed lest they spread the disease to the beet.

Downy mildew (p. 13).—This disease, caused by *Peronospora schachtii*, is briefly described, but it has not yet appeared in this country.

Further observations upon the effect of soil conditions upon the development of the potato scab, H. J. WHEELER, J. D. TOWAR, and G. M. TUCKER (*Rhode Island Sta. Bul. 30, pp. 66–85, figs. 22*).—In this bulletin is given a continuation of investigations of the authors, reported in Bulletin 26 of the station (E. S. R., 5, p. 590), on the influence of air-slacked lime upon the development of potato scab. The authors are strongly inclined to question whether the corrosive sublimate, or any other treatment which does not seriously impair the vitality of the tuber, will destroy all germs on contaminated seed tubers.

A series of plat experiments was conducted in 1894 to test the effect of the use of lime on the acid soils of the station, the efficiency of the corrosive sublimate treatment, the value of soda as a substitute for potash, and pot experiments to determine the effect, if any, of using other forms of lime than carbonate.

In the first experiment the limed plats had received 2½ tons per acre of air-slacked lime in 1893, and ½ ton additional in 1894. One lot of seed tubers treated with corrosive sublimate was planted on soil that had not grown potatoes for many years. A second lot of untreated tubers was planted on soil supposed to be uncontaminated, while a third was planted on soil that had grown a crop of potatoes in 1893. The limed plats in all 3 cases produced scabbed potatoes, while the acid soils gave scabbed tubers only in 2 cases where untreated seed had been used. Sugar beets grown between the rows where no potatoes had been previously raised were in all cases free from scab, showing that the disease does not spread laterally with very great rapidity.

In the second experiment to test the value of the corrosive sublimate treatment, no potatoes had been grown on the plats for at least 10 years, and the application of lime was the same as in the previous experiment. The authors summarize their conclusions on this experiment as follows:

"(1) In every instance there is a greater percentage of scabbed tubers on the limed than on the unlimed sections where the seed tubers were not previously treated with corrosive sublimate solution.

"(2) The treatment with corrosive sublimate solution appears to have unquestionably reduced the percentage of scab upon the limed sections.

"(3) In case of the unlimed sections, there was in one instance a greater percentage of scab where the seed tubers received the corrosive sublimate treatment, while in the three other instances the per cent of scab was less. These results are contradictory in two instances, and in the other two the differences are so slight that as a whole no practical advantage from the treatment is apparent.

"(4) It will be seen that without exception some scab resulted on both limed and unlimed sections of the plat, even when the corrosive sublimate treatment of the seed tubers was employed. Bearing in mind that beets, grown in another place upon soil known to have been previously contaminated with the germs of the disease, were badly scabbed, and in consideration of the fact that beets have in no other instance been found to be scabbed when grown on any of the plats in the vicinity, we have striking circumstantial evidence from the scab upon the tubers grown from treated 'seed' that they probably owed their diseased condition to the introduction of undestroyed germs on the seed tubers and not to the preëxistence of the germs in the soil itself."

In the third experiment the primary result was not a study of potato scab, but the tabulated results show a tendency of lime to increase the potato scab.

In the pot experiments the object was to test the effect of different forms of lime on scab development. It is claimed that wherever lime in the form of carbonate or in forms capable of producing carbonates was used the per cent of scab was increased. Sulphate of lime gave conflicting results. Calcium chlorid gave least scab, but it injured the growth of the potatoes. No attempt is made to draw definite conclusions from this series of experiments.

The authors conclude as follows:

"Experiments with air-slacked lime covering a period of 2 years show conclusively that it tends to increase the scab of potatoes.

"Since wood ashes contain about one half as much lime in practically the same form, there remains almost no question but that they will also increase the scab. One ton of air-slacked lime contains in general a little less than 2 tons of wood ashes.

"It seems probable that the natural acidity or sourness of the soil tends to check the spread of the disease, and the tendency of barnyard manure to increase it may reasonably be attributed to its alkaline action, by which the sourness is overcome.

"If the farm stock is fed on scabbed beets or potatoes in an uncooked condition, then barnyard manure may still further increase the disease by carrying to the soil germs which have passed through the digestive organs of the animal undestroyed. If a soil is very acid small quantities of barnyard manure, wood ashes, and air-slacked lime will probably have far less tendency to increase the scab than when large quantities are used. The amounts which it would be safe to apply are doubtless dependent upon the sourness of the soil. The safest course, until absolutely effective means of disinfecting the seed tubers are found, would be to avoid these substances altogether, provided potatoes are to be grown successively or in frequent rotation upon the same land. Upon such soil lime not only increases the total yield but also the percentage of tubers of large size, so that if only one crop were to be grown the use of lime would prove decidedly beneficial, for the effects from the scab are not serious the first year. When grown under these conditions, the corrosive sublimate treatment has lessened decidedly the amount of scab. It is possible by the use of this treatment that potatoes may be grown upon limed soil successively or in frequent rotations without the arising of serious injury from the scab, yet our observations up to the present time make it appear very doubtful if this can be done."

Experiments conducted with about 50 agricultural plants show that lime favors the growth of most of them, and the development of scab on potatoes is the only drawback to its general use on acid soils that has so far been observed by the authors.

Report of the botanist, L. R. JONES (*Vermont Sta. Rpt. 1893, pp. 41-69, figs. 7*).—The author gives detailed reports on experiments in spraying potatoes; time and rate of growth of potato tubers and effect of premature death of potato tops on the yield; relation of time of planting potatoes to diseases; and a spray cart for potatoes. These different articles are in the main reprinted from Bulletin 40 of the station (E. S. R., 5, p. 988).

In the experiments in spraying potatoes the author reports in detail on the use of Bordeaux mixture, ammoniacal copper carbonate, copper and ammonium carbonate solution, modified eau celeste, sulphosteatite and copper sulphate of various strengths of solution. The author considers that Bordeaux mixture is the best fungicide for the prevention of potato diseases.

A report is given on the loss occasioned by oat smut in Vermont in 1893. Ninety-eight fields were sampled, the total number of heads examined being 39,826, showing that 0.82 per cent was smutted. A comparison of Vermont-grown seed with that grown in other localities shows less smut from the home-grown seed.

Black knot of plums and cherries and methods of treatment, E. G. LODEMAN (*New York Cornell Sta. Bul. 81, pp. 635-656, figs. 6*).—According to the author the black knot of plums and cherries, which is due to *Plowrightia morbosa*, was first troublesome in the eastern part of the United States, and it has spread westward through the introduction of diseased plants from the East. The life history of the fungus is given in considerable detail and various remedial treatments suggested. In 1893 some experiments were begun at the station for the prevention of the disease. A thicket of Morello cherry trees and sprouts was taken for the experiment, and 5 applications of Bordeaux mixture made in that year. In 1894, after 1 application of the fungicide, all the knots were cut out and counted on the treated and untreated portions of the plat. During this year 8 applications of Bordeaux mixture were made, and on November 26 the new knots were removed from both the sprayed and unsprayed portions. On April 25 the knots removed from the unsprayed portion were 2,002; the sprayed, 1,155. On November 26 the number of knots removed from the unsprayed portion was 3,529, of which 3,466 were new knots; from the sprayed portion 240 knots were removed, of which 165 were new, showing that the application of the fungicide had materially decreased the disease.

The author recommends the following treatment: Spray (1) during the latter part of March or early in April, (2) when the buds begin to swell, (3) as soon as the new knots begin to show their velvet coating, (4) at intervals of 2 or 3 weeks as may seem necessary.

As some of the applications for the control of black knot are made at a time when other diseases require treatment, but little extra labor is involved in the spraying for the prevention of knots. The author thinks that the spraying of plums and cherries to protect them from the black knot fungus can be carried on with profit in all sections where this disease threatens to interfere seriously with the profitable cultivation of these fruits. A bibliography of the black knot literature is included in the bulletin.

Aureobasidium vitis, G. DE LAMARLIERE (*Rev. Mycol., 17 (1895), No. 2, pp. 54–56*).—A review of recent literature, with critical notes.

Notes on Fusicoccum abietinum, R. FERRY (*Rev. Mycol., 17 (1895), No. 1, p. 25*).

Recent observations on the external characters of black knot, G. LAVERGNE and E. MARRE (*Rev. Vit., 2 (1894), p. 498*).

Recent investigations on the common mold (Penicillium glaucum), ELFVING (*Bot. Centbl., 61 (1895), p. 154*).

The cherry fruit mold, B. D. HALSTED (*Garden and Forest, 8 (1895), pp. 137, 138*).—A brief description is given of *Monilia fructigena* and its attack on cherries, plums, and peaches.

Some new or little known fungi of cultivated plants, PRILLIEUX and DELACROIX (*Bul. Soc. Mycol. France, 1894, p. 161*).—Notes are given of *Septoria petroselini apii* on celery; *Colletotrichum oligochætum* on melons, *Macrophoma vestita* on the roots of *Theobroma cacao*, and *Fusarium sarcochroum* on ailanthus.

New German grain fungi, B. FRANK (*Ber. deut. bot. Ges., 13 (1895), No. 2, pp. 61–65*).—Critical notes are given of *Leptosphæria herpotrichoides*, *L. tritici*, *Sphærella basicola*, n. sp., *Ophiobolus herpotrichus*, *Septoria exitialis*, *S. graminum*, *S. glumarum*, *S. briosiana*, *S. avenæ*, n. sp., *Ascochyta graminicola*, and *Phoma hennebergii*.

Diseases of lettuce and radishes, L. H. PAMMEL (*Amer. Gard., 16 (1895), No. 36, p. 150*).—Descriptions are given of *Botrytis* and *Cystopus* on the above plants.

Leaf blight of the strawberry, L. H. BAILEY (*New York Cornell Sta. Bul. 79, pp. 600–602, fig. 1*).—Brief illustrated remarks are made on the blight or rust of strawberry leaves (*Sphærella fragariæ*) which affects different varieties to a varying extent. Spraying with Bordeaux mixture, and prophylaxis by setting healthy plants on clean land, is recommended.

Anthracnose of watermelon, F. A. WAUGH (*Amer. Hort., 5 (1895), No. 4, p. 61, fig. 1*).—Notes on the prevalence, extent of injury, method of attack, and treatment of this disease.

The polyporus of olives (*Prog. Agr. et Vit., 12 (1895), No. 13, p. 348*).—A brief note is given calling attention to the presence of *Polyporus fulvus oleæ* on the olive trees of Italy.

Strawberry leaf curl, B. D. HALSTED (*Garden and Forest, 8 (1895), p. 148*).—A new form of disease, probably due to *Sphærella fragariæ*.

On brunissure of grapes, U. BRIZI (*Bul. Soc. Bot. Ital., 1894, p. 283*).

The bacterial gummosis of the grape, PRILLIEUX and DELACROIX (*Prog. Agr. et Vit., 12, (1895), No. 11, pp. 271–277; No. 12, pp. 312–321*).—Reprinted from *Annales de l'Institut Agronomique*.

Report on a disease of chestnuts in Bretagne, France, L. CRIÉ (*Bul. Min. Agr. France, 13 (1894), pp. 884–892*).

An orchid disease, G. MASSEE (*Ann. Bot., 9 (1895), No. 33, p. 170*).—A preliminary report is given of a brown spot disease of orchid leaves caused by *Plasmodiophora orchidis*. A more detailed description is promised later.

A disease of the plane tree, LECLERC DU SABLON (*Rev. Mycol., 17 (1895), No. 2, pp. 57–59, table 1*).—Illustrated description given of a disease due to *Glœosporium platani*.

The prevention of potato scab, L. R. TAFT (*Mich. Press Bul., Jan., 1895, pp. 4, figs. 3*).—Directions are given for the treatment of seed potatoes with corrosive sublimate for the prevention of scab.

The use of lysol to prevent mildew, L. DEGRULLY (*Prog. Agr. et Vit., 12 (1895), No. 14, p. 355*).—The author advises caution in its use and recommends that it should not be used in greater strength than 0.5 per cent.

New remedies for grape mildew, J. DUFOUR (*Chron. Agr. Canton Vaud., 8 (1895), No. 4, pp. 78–80*).—Methods for preparation are given for a copper and molasses mixture, copper and tannin mixture, lysol, and a powder from which Bordeaux mixture can be made.

The preparation of Bordeaux mixture, E. G. LODEMAN (*Garden and Forest, 8 (1895), pp. 159, 160*).—The author prefers weighing the substances to form the mixture or depending on the color to the potassium ferrocyanid test. He shows the necessity of an excess of lime in the mixture to prevent injurious changes that take place in neutral mixtures.

Bordeaux mixture and color tests, S. A. BEACH (*Garden and Forest, 8 (1895), p. 128*).—Notes are given on the use of potassium ferrocyanid in testing Bordeaux mixture, and where the preparation is in inexperienced hands the ordinary method of weighing is to be preferred.

A kerosene attachment for spraying pumps, E. S. GOFF (*Garden and Forest, 8 (1895), p. 143, figs. 2*).

How and when to spray (*Amer. Gard., 16 (1895), pp. 146, 147*).—A spray calendar with formulas for fungicides and insecticides is given.

Spraying potatoes, L. R. JONES (*Vermont Sta. Rpt. 1893, p. 20*).—A summary of Bulletin 40 of the station (E. S. R., 5, p. 988)

ENTOMOLOGY.

The cabbage root maggot, with notes on the onion maggot and allied insects, M. V. SLINGERLAND (*New York Cornell Sta. Bul. 78, pp. 481–577, figs. 18*).

Synopsis.—An elaborate illustrated paper on the cabbage root maggot (*Phorbia brassicæ*), giving in detail the description, life history, and the results of extended experiments with remedies against its ravages. Brief comparative notes are also given for several allied species. Injecting carbon bisulphid into the ground a few inches from each plant is recommended as the most effective method of destroying the pest, although the application of carbolic acid emulsion is also advised.

The work recounted in this bulletin was undertaken at the request of numerous cabbage growers on Long Island, where extensive growing of cabbages is done and where the cabbage root maggot for many years has proved a pest, annually destroying many acres of the vegetable. The insect was first noticed in the United States in 1835, being introduced from Europe into Massachusetts, and from there has since gradually spread over the greater portion of the United States and Canada, where it is now sufficiently abundant to destroy thousands of acres of cabbages, cauliflowers, radishes, and turnips every year. Although the favorite and presumably native food plant of the insect is *Brassica oleracea*, embracing the cabbages, kales, collards, brussels sprouts, cauliflower, and broccoli, quite a range of food plants is shown, apparently, however, confined chiefly to *Cruciferæ*. In addition to the vegetables mentioned the radish, turnip (*Brassica rapa*), ruta-baga and swede (*B. campestris*), common winter cress (*Barbarea vulgaris*), and hedge mustard (*Sisymbrium officinale*) are attacked. Breeding experiments, evidence of other observers, and comparative study of cabbage and radish maggots seem to indicate that the cabbage and the radish maggot are the same species. The similar maggots infesting onions, beans, and raspberry canes are different insects, distinct from each other and from the cabbage root maggot.

The plants first show the effects of the presence of the maggots after they have been set in the field 2 or 3 weeks, on Long Island about May 15, the time, however, varying with season, locality, and latitude. The first indication is shown by a checking of the growth of the plant, a tendency to wilt badly under a hot sun, and a sickly bluish cast to the foliage, following which the plant in a few days wilts, falls over, and dies. The result is affected by the size of the plant, the number of maggots at work, and the soil and weather conditions, a rich soil and plenty of moisture enabling the plants to withstand the attacks of the maggot for a long time.

"The full grown cabbage maggot is about 0.32 in. (8 mm.) in length, white, cylindrical, tapering cephalad and obliquely truncate caudad, with 12 fleshy tubercles around the caudal margin, the lower two of which are 2-toothed; and the cephalic spiracles have 12 divisions." The pupa is shorter, measuring about 0.2 in. in length, and is of an elliptical ovate form, and light brown, becoming darker with age. Specimens are easily found in the soil about infested plants in June.

Illustrations from micro-photographs of both sexes of the adults are given. By a casual observer the adult fly might be mistaken for the common house fly, which it resembles in general appearance, but from which it differs by its smaller size, being only about 0.2 in. (5 mm.) in length. The sexes differ considerably in appearance, as is shown by the following descriptions:

"The male fly is of a general dark ash-gray color, with 3 rather broad blackish dorsal stripes on the thorax, and a wide, black, dorsal stripe extending along the abdomen, becoming narrower toward its extremity and more or less dilated opposite the upper margin of each segment, which is marked with a narrower transverse black stripe. Many bristly hairs project from different parts of the body, and the abdomen is subcylindrical, narrow, and but slightly tapering. The eyes, occupying a greater portion of the head, nearly touch each other above. The legs are black and strongly bristled; on the under side of each hind femur near its base is a tuft of these bristles; which are characteristic of this cabbage fly. This tuft is quite noticeable on the femur of the male fly, especially when comparison is made with the corresponding femur of the female; by this character alone the male insect can be recognized and separated from the other common anthomyiian pests. There is also a characteristic row of short bristles, unequal in size, on the inner side of the hind tibia of the male insect that will help to distinguish the species.

"The female fly is of a lighter ash-gray color, quite indistinctly striped on the thorax and abdomen, and not so strongly bristled as the male. Her eyes are also quite widely separated above. The abdomen is of a more elongate ovate shape with a pointed apex. There seems to be no special characteristic by which the female fly can be recognized and separated from some of the other common anthomyiians; it is necessary that it be found associated with its male to determine it with certainty."

For comparison illustrated descriptions are given of the onion maggot (*Phorbia ceparum*), root maggot (*Anthomyia radicum*), and fringed anthomyiian (*Phorbia fusciceps*). The onion maggot closely resembles the cabbage root maggot in size, shape, and color, but differs in certain anatomical features, especially in the arrangement and number of the fleshy tubercles of the caudal segment. The adult onion fly resembles the cabbage fly, but is slightly larger, and the hind femur is comparatively bare of hair at the base, while in the cabbage fly the base of the femur carries a tuft of hair. The life histories are much the same. But one specimen of the root maggot has been taken in the United States, and therefore no immediate damage is anticipated from it. The maggots of the fringed anthomyiian are much smaller than the onion maggots or cabbage root maggots, and are not nearly so destructive to vegetation. They feed on a number of plants and also on the eggs of the Rocky Mountain locust.

The relation of the cabbage root maggot to the club root of cabbages, which is popularly supposed by gardeners to be caused by the insect, is discussed, and the disease is shown to be due to the cabbage slime mold (*Plasmodiophora brassicæ*). The disease and maggot attacks may, however, and frequently do, occur on the same plant.

The flies first appear in the latter part of April and the first of May, when the female flies may be seen running over the ground about the cabbage plants endeavoring to find some crevice by means of which they can creep beneath the surface of the soil and deposit their eggs close to the cabbage stem. About 55 eggs are probably laid by each fly, although some hundreds of eggs may be laid about a single plant by different flies. The eggs are white, irregularly ridged and grooved longitudinally on one side, and 0.04 in. in length. The eggs hatch in from 4 to 10 days, depending on the weather, but efforts made to breed the insect from eggs in confinement were unsuccessful. The young maggots immediately attack the surface of the root, rasping out burrows along the surface, and first devoting themselves to the rootlets, after which the main root is eaten and often girdled. The burrows are slimy, and the decaying roots upon the death of the plant give out a sickening odor. The larval stage is believed to be about 3 weeks, when the maggots work their way into the soil an inch or two from the roots and there pupate. The pupal stage continues from 15 days to over 3 months, but the majority of flies issue in about 20 days.

It has been believed that there are 3 or 4 annual broods of the insect, but the investigations show that there are but 2 distinct broods, with possibly a third. The flies of the first brood appear in April and shortly deposit their eggs, from which about three fourths of the second brood appear in June, the remainder emerging at varying times throughout the summer. The maggots of this second brood work on the plants in July, pupate, and some of them emerge as adults the latter part of that month or in August as a third brood, but the majority hibernate as pupæ to emerge the following spring.

As natural enemies are mentioned chickens and rooks, which are fond of the maggots, but in eating them usually pull up the cabbage plants, so that aid of this kind is not advised. In England several small hymenopters are parasitic to the cabbage root maggot, none of which are found in this country. However, a cynipid (*Trybliographa anthomyiæ*) has been bred from pupæ in various parts of the United States, and it is believed will play an important part in checking the pest. In addition a staphylinid beetle (*Aleochara nitida*), in both its larval and adult forms, attacks the maggots and pupæ. In some instances the larvæ of the beetle gnaw their way into the pupæ of the pest, devouring the contents, and undergo their metamorphoses within the shell. A species of *Trombidium* also is an enemy of the cabbage fly, sucking the eggs.

About 70 different methods have been recommended for combating the cabbage root maggot and many of them were employed in the experiments here given. Only 6 are regarded as effective and recommended to be employed, although 9 others are classed as doubtful or partially effective. The effective methods are divided into preventive and destructive measures. Frames covered with cheese cloth or fine netting and placed over the plants proved an efficient protection against the flies, but are only practicable with small areas and a few choice plants. Tarred paper cards cut hexagonally, with a slit reaching to the center, where a star-shaped cut was made to accommodate the stem of the plant, were applied to the young plants on setting them in the field, and pressed closely down to the surface of the ground. By this means the female fly was unable to get at the base of the stem to lay her eggs, and thus the plants were protected. Two rows of 300 plants each were protected by means of the tarred cards on April 19, and on May 21 less than 50 plants were attacked in each of the rows, while hardly 50 plants remained standing in 4 equal untreated rows used as checks. The cards were made of the paper called "1-ply tarred felt" and were cut out by a stamping tool 1½ in. on the side. This method is believed to afford almost complete protection to cabbages and cauliflowers.

Destructive measures, such as crushing the eggs by rubbing the stems of the cabbages with the fingers every few days and by hand picking the maggots, proved effectual, but the amount of work required will hardly recommend them. Two insecticidal substances proved very efficient, a carbolic acid emulsion and soil injections of carbon bisulphid. The carbolic acid emulsion was made by dissolving 1 lb. of hard soap or 1 qt. of soft soap in a gallon of boiling water, to which 1 pt. of crude carbolic acid was added, and the whole stirred into an emulsion. One part of this was added to 30 parts of water and poured around the bases of the plants, about 4 oz. being used at each application, beginning when the plants were set out and repeated every week or 10 days until the last of May. To bring about the best results some of the earth should be removed from about the plants before pouring on the emulsion. In the experiments none of the cabbages were injured. This method is believed to be a most successful and practicable one for treating radishes, turnips, or onions, but for cabbages and cauliflowers the application of carbon bisulphid is preferred. This is applied by means of a newly devised injector, consisting of a large syringe with a cylinder large enough to hold about 2 qt. of the chemical and so constructed as to deposit from a teaspoonful to a tablespoonful of the liquid at every motion of the piston. The nozzle of the instrument should be inserted into the soil 3 or 4 in. from the plant and pushed downward to a point a little below the roots. The chemical should then be expelled, the injector withdrawn, and the hole filled with earth by means of the foot. One injection is usually sufficient, to be given when the maggots have well appeared. The cost is about 1 ct. for every 10 plants.

The methods designated as doubtful or but partially effective are the application of gas lime, kerosene oil and sand, lime, and liquid manure to the soil, and the employment of cultivation. Of insecticides hellebore and kerosene emulsion produced conflicting results. The destruction of the pupæ by destroying the "old stumps," by fall plowing, and by the use of gas lime is also classed among these methods.

Among the numerous methods that have been thoroughly tested and found ineffective or impracticable may be mentioned soil selection, time of planting, trap crops, different fertilizing substances, rotation of crops, and various insecticides. Tobacco decoction and kainit are regarded as not having been sufficiently tested, but are not believed to be desirable.

In conclusion the bibliography and synonymy of the insect are worked up and its identity and relationships discussed.

Report of entomologist, G. H. PERKINS (*Vermont Sta. Rpt. 1893, pp. 119–145, figs. 19*).—Brief popular notes on insecticides and on various insects that proved more or less injurious throughout the State during the year, with prefatory remarks on the nature and methods of investigations in economic entomology and the care and perseverance required.

Directions are given for the preparation of various insecticides, and experiments are mentioned for proving their respective efficiency. Paris green and lime, and kerosene emulsion, are advised for insects attacking the foliage; dilute kerosene emulsion for root-infesting insects; and bisulphid of carbon for grain insects. Experience with potash salts used as fertilizers leads to the opinion that their insecticidal powers have been overrated.

An insect new to the State, *Catastega aceriella*, is mentioned as attacking maple leaves, constructing a web-covered tunnel on the undersides of the leaves. Considerable damage to the shade trees is feared, and spraying with Paris green or arsenate of lead as soon as the caterpillars appear in the spring is advised.

Illustrated descriptive, life history, and remedial notes are given for the horn fly (*Hæmatobia serrata*), apple maggot (*Trypeta pomonella*), and various cutworms, particularly the following: *Agrotis ypsilon*, *Peridroma saucia*, *Noctua clandestina*, *Feltia subgothica*, *Carneodes messoria*, *Mamestra subjuncta*, *Xylophasia devastatrix*, and *Nephelodes minians*.

The horn fly has spread over the most of the State and is causing more or less annoyance. Spraying infested cattle with kerosene, destroying the eggs of the flies by sprinkling quicklime over the droppings, and other common remedies are advised.

The life history of the apple maggot is given in detail, attention being called to the fact that the eggs are laid in the pulp of the apple instead of on the skin and that they are deposited from July until frost, thereby a continuous appearance of adults being provided. Destroying windfalls, preferably by turning hogs into the orchards, is recommended, and burning the grass during the winter in such orchards as are kept in sod. It is believed also that lime, ashes, salt, or similar substances applied to the ground will have the effect of destroying the larvæ at the time of pupation.

Twenty-six species of cutworms are cited as occurring in Vermont, but only those mentioned above are considered worthy of notice in detail. Poisoned trap food, fall plowing, and other usual treatment is recommended.

Habits and metamorphoses of insects (Coleoptera, Ptinidæ), IV, V. XAMBEU (*Ann. Soc. Ent. France, 63 (1894), pp. 459–504*).—The author introduces this paper with a general account of the characteristics of the larvæ and pupæ of European *Ptinidæ* (=subfamily *Ptininæ*, Lec. & Horn), their habits, mode of occurrence, and injuries done by them. The eggs of one species, *Ptinus irrotatus*, are described. Two hymenopterous parasites are mentioned, and one of them, *Scleroderma* sp., bred from the pupæ of *Ptinus brunneus*, is described in the larva and imago states. The larvæ of the following species of *Ptinidæ* are described in detail: *Hedobia pubescens*, *H. imperialis*, *Ptinus brunneus*, *P. dubius*, *P. ornatus*, *P. germanus*, *P. sexpunctatus*, *P. fur*, *P. aubei*, *P. irroratus*, *P. auberti*, *P. latro*, *Niptus submetallicus*, *N. crenatus*, *N. holosericeus*, *Mozium sulcatum* and *Gibbium scotias*. A bibliography of the biology and notes on geographical distribution conclude the article. Most of these species are of economic importance and a number of them occur also in North America, while others are sure to be imported in the course of time.—E. A. SCHWARZ.

Legislation against injurious insects, L. O. HOWARD (*U. S. Dept. Agr., Division of Entomology Bul. 33, pp. 46*).—This consists of a compilation of the laws and regulations in the United States and British Columbia regarding insecticide work, and providing for the inspection and quarantine of trees, shrubs, fruits, and other objects upon which injurious insects may be introduced. The legislation against injurious insects is quoted from the statutes of California, Oregon, Washington, Idaho, New Jersey, Colorado, Missouri, Kansas, Minnesota, Nebraska, and British Columbia. The laws are more extensive and comprehensive in California, Oregon, and other western States. In the west-central States the legislation is almost entirely against grasshoppers. In addition is given the legislation against foul brood in New York and Utah.

This compiled bulletin is issued to attract the attention of agriculturists and horticulturists toward the necessity for the passage of such laws and to form an easy source of information for persons engaged in the drafting of such regulations.

Spray calendar, E. G. LODEMAN (*New York Cornell Sta. Cir., Feb., 1895*).—This consists of a table showing the times, substances, and methods for spraying various orchard and small fruits and flowers, as preventive means against insects and fungus attacks. The directions for making the applications are briefly and concisely summarized in the different columns of the table. In addition formulas are given for the preparation of Bordeaux mixture, ammoniacal copper carbonate, copper sulphate solution, Paris green, London purple, hellebore, and kerosene emulsion.

Histological observations on the functional adaptations of the epidermic cells of insects, J. CHATIN (*Compt. Rend., 120 (1895), No. 4, pp. 213–215*).

Two new species of Lecanium from Brazil, T. D. A. COCKERELL (*Amer. Nat., 28 (1895), No. 2, pp. 174, 175*).—*L. reticulatum* and *L. baccharidis* are described as new.

The imported cabbage butterfly, A. N. CAUDELL (*Amer. Hort., 5 (1895), No. 2, pp. 22, 23, figs. 3*).—Popular life history and remedial notes, dusting with Paris green being recommended.

The cabbage plusia, A. N. CAUDELL (*Amer. Hort., 5 (1895), No. 2, p. 21, fig. 1*).—A brief popular descriptive note on *Plusia brassicæ*.

The turnip gall-weevil, S. HEATON (*Gard. Chron., 17 (1895), p. 398, fig. 1*).—A description of *Centorhynchus sulcicollis*. Gas lime at the rate of not more than 30 cwt. per acre is recommended as a preventive treatment.

A spring wheat pest, CLAUSEN (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 11, pp. 162, 163*).

A destructive caterpillar (*Ztschr. landw. Ver. Hessen, 1895, No. 9, pp. 68, 69*).—Notes are given on a silk-spinning caterpillar which has caused considerable damage to the leaves of *Helleboris niger*.

Injurious insects and fungi (*Jour. [British] Bd. Agr., 1 (1895), No. 3, pp. 300–316*).—Illustrated descriptions with suggestions for their repression are given for the woolly aphis and goat moth, and notes on horticultural legislation in British Columbia, cabbage root maggot in America, and wireworms.

Legislation against injurious insects, J. B. SMITH (*Ent. News, 6 (1895), No. 4, p. 122*).—Comments upon Bulletin 33 of the Division of Entomology, U. S. Department of Agriculture (E. S. R., 6, p. 916).

The inefficiency of Botrytis tenella in combating white grubs (*Rev. Scientif., 3 (1894), ser. 4, No. 14, p. 441*).—The author calls attention to the failure of *Botrytis tenella* for the repression of white grubs.

FOODS—ANIMAL PRODUCTION.

Investigations on pepsin digestion, F. KLUG (*Pflüger's Arch. Physiol., 60, No. 182, pp. 43–70*).—The author studied this subject with reference especially to the effect of the strength of the pepsin solution, the percentage of hydrochloric acid it contains, the duration of digestion, and the temperature. Pepsin prepared from the stomach of cattle, swine, and dogs was used, and the products of the digestion were investigated. His conclusions are as follows: (1) Of a number of extracts of a stomach lining made consecutively, the first is less powerful than the later ones. The activity of the first extract can be increased by diluting with water acidulated with hydrochloric acid, or by allowing it to stand for 24 hours before using. (2) For studies in artificial digestion cooked egg albumen is best fitted, but it must be borne in mind that this contains about 0.7 per cent of deutero-albumose. (3) Ammonium sulphate and common salt both retard pepsin digestion, the latter about 0.5 per cent. (4) The quantity of the pepsin in the digestive fluid, that is, the strength of the solution, is of marked effect on digestion. A solution containing 0.5 to 0.01 per cent of pepsin digests best, and the activity of the solution diminishes as it is stronger or weaker than this. Pepsin from the dog is most active in a 0.01 per cent solution, while that from pigs or cattle works best in a 0.1 per cent solution. (5) Pepsin digests best in the presence of 0.5 to 0.6 per cent of hydrochloric acid. Hence, a solution containing 0.1 per cent of pepsin and 0.6 per cent hydrochloric acid is the most advantageous. Twenty centimeters of such a solution will bring 6 gm. of hard cooked egg albumen into solution in 10 to 15 hours. (6) The digestion progresses rapidly during the first 10 to 15 hours, especially the first 4; after that it progresses very slowly; the formation of peptone and albumoses steadily increases, while by long continued digestion the syntonin gradually decreases. (7) In all the tests made syntonin and albumoses could be detected in the digestive solution within 5 minutes after the digestion had begun. (8) Where the pepsin from cattle and swine was used peptone did not appear until nearly 4 hours after commencing, while with dog pepsin it appeared in 20 to 40 minutes. (9) Since the pepsin from the dog surpasses that from cattle or pigs in activity, it is believed probable that there are different pepsins. (10) Digestion takes place at as low a temperature as 0° C. and increases with increasing temperature up to 50 to 60° C., above which it diminishes and ceases at 80° C. (176° F.). (11) Syntonin (precipitated by neutralizing) and the albumoses (obtained by ammonium sulphate) appear in the digestive solution simultaneously. (12) Syntonin does not occur as a result of the hydrochloric acid alone, but like the albumoses and peptone is a product of the united action of the hydrochloric acid and pepsin. (13) Ammonium sulphate and common salt both retard pepsin digestion, the latter about 0.5 per cent.

Comparing prairie hay with timothy hay, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp. 65–81*).—This comparison was made on 16 cows divided into 4 lots. These lots were fed grain with timothy hay or prairie hay in alternating periods, silage being added to the ration of 2 of the lots all the time. The grain consisted of a mixture of bran, ground barley, corn meal, and linseed meal.

"The prairie hay secured was fine in blade, of good quality, apparently early cut and not exposed to rain before stacking. It was almost free from swale grass and tall blue joint. The timothy hay was medium fine, rather short, cut early and properly cured, had a fine flavor, good color, and was first grade in every respect."

The analyses of the feeding stuffs used are tabulated, together with the record of the food consumed and milk and fat produced by each cow in the several lots.

In calculating the financial result prairie hay is valued at $3.20 and timothy hay at $5.60 per ton. The general summary of results is as follows:

"(1) As between early cut and well cured timothy hay and fine well cured upland prairie hay, cows preferred the prairie hay.

"(2) Prairie hay was at least equal to timothy for the production of milk and butter fat.

"(3) At the present price of the 2 kinds of hay, milk was produced at 13 per cent less cost and butter fat at 12 per cent less cost when prairie hay was fed."

Ensiling soja bean and vetch, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 109, 110*).—Soja bean and Russian or villous vetch were each grown on plats containing 2,500 sq. ft., and the green crops cut and ensiled, a part of the soja bean by itself and a part mixed with the vetch.

"After about 6 months the silos were opened and the contents fed out. The cows ate the silages readily, but the quantities were too small to admit of experimental feeding. Both silages kept nicely and had a pleasant aromatic odor."

The losses in ensiling are calculated. These amounted to 14 per cent of the dry matter in case of the soja bean and 25 per cent in case of the soja bean and vetch. The composition of the green material and the silage is given as follows:

Composition of green and ensiled soja bean and villous vetch.

	Moisture.	Composition of dry matter.							
		Crude ash.	Crude protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Nitrogen.	Phosphoric acid.	Potash.
	Pr. ct.	*Pr. ct.*	*Pr. ct.*	*Pr. ct.*	*Pr. ct*	*Pr. ct.*	*Pr. ct.*	*Pr. ct.*	*Pr. ct.*
Soja bean, green fodder	75.36	12.16	20.29	22.53	41.56	3.46	3.24	0.709	1.775
Soja bean silage.	77.16	19.00	17.61	26.09	34.44	2.86	2.81	.625	2.246
Villous vetch and soja bean, green fodder	80.30	14.85	21.46	22.85	35.16	5.68	3.43	.748	2.407
Villous vetch and soja bean silage	81.50	19.73	18.90	27.12	27.21	7.04	3.01	.869	2.935

Feeding test with various silages, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 70–81*).

Robertson mixture vs. corn silage (pp. 70–75).—The object of this trial was to compare the composition and the feeding value of silage made from a mixture of corn, horse beans (whole plant), and sunflower heads, as proposed by Prof. J. W. Robertson, of Canada, with silage made from corn alone. Two fifths of an acre of corn, one fifth of an acre of horse beans, and one tenth of an acre of sunflowers were planted for this purpose and cultivated as usual. All except the horse beans did well. Early in October this Robertson mixture was harvested and ensiled in one half of a silo, the other half being filled with ordinary corn. The silo was in poor repair, and the loss in ensiling was unusually large. It amounted to 33 per cent of the dry matter for the corn silage and 43 per cent for the mixed silage. Analyses are given of the materials as put in the silo and of both kinds of the good and spoiled silage. The following table shows the composition of the materials as put in and the silage taken out:

Composition of green and ensiled material.

	Water.	Composition of dry matter.							
		Crude ash.	Crude protein.	Crude fiber.	Nitrogen-free extract.	Ether extract.	Nitrogen.	Phosphoric acid.	Potash.
	Pr. ct.	*Pr. ct.*	*Pr. ct.*	*Pr. ct*	*Pr. ct.*	*Pr. ct.*	*Pr. ct*	*Pr. ct.*	*Pr. ct.*
Corn fodder as put in	77.21	5.42	7.59	23.26	59.49	4.24	1.21	0.430	1.509
Silage mixture as put in	74.91	5.87	10.53	21.36	56.07	6.17	1.68	.497	1.612
Corn silage as taken out	79.16	8.11	10.24	26.00	53.85	3.80	1.65	.470	1.921
Silage mixture as taken out	79.30	8.52	12.10	23.89	50.16	5.33	1.93	.717	2.376

"The effect of the horse beans and sunflower heads in the Robertson mixture is plainly shown in the protein and ether extract percentages.

The feeding value of these 2 kinds of silage was tested in a feeding trial with 5 cows, covering 4 periods of 3 weeks, which began December 24. The trial was rather unsatisfactory, as 2 of the cows were found to be tuberculous and were slaughtered, and the others were removed to an old barn, where they suffered much from the cold and were evidently affected by the changed conditions. The results of the trial are tabulated. Under the conditions prevailing "the mixture did not in these cases appear superior to corn silage in feeding value. We do not feel, however, justified in laying much stress on the results owing to the unfortunate complications."

Rye silage vs. corn silage (pp. 75–77).—Twelve cows were divided into 2 lots and fed during 2 periods of 4 weeks each on rye silage or corn silage, the lots being alternated on these. The cows received corn meal, wheat bran, and hay in addition to the silage. The composition of the corn and rye silage is given.

"The rye silage was much drier than the corn silage and was not relished as well. The cows were induced to eat all they would, yet left a good many orts, and ate but three quarters as much dry matter."

The results of the feeding are tabulated. Considerably more hay was eaten with the rye silage than with the corn silage. About 10 per cent less milk and butter was produced on the rye silage. There was a shrinkage of about 2 per cent in passing from corn silage to rye silage, and a gain of about 2 per cent in changing from rye to corn silage. The indications are that there was a loss of about one half from natural fermentation and fire fanging in ensiling of rye.

Corn and soja bean silage vs. corn silage (pp. 77–79).—Four rows of corn, equivalent to one fifth of an acre, with soja beans planted in the same rows, was harvested and ensiled separately; and for comparison an equal area of the same corn grown without soja beans. The composition of the materials as put in and of the 2 kinds of silage as taken out is given. The 2 kinds of silage were fed to 2 lots of 2 cows each in alternating 18-day periods.

"Both kinds of silage were well relished." . . .

"The milk was richer in both cases during the soja bean and corn silage feeding. This latter appears to be, practically, the only gain made by the addition of the soja bean to the corn.

"It would appear, then, that the addition of this small amount of soja bean plants to the corn in the silos did not materially improve the silage, or increase the milk or butter yields. Planting in the row with the corn was found to be better than planting in separate rows, because of greater economy of room and labor."

Pea and oat, and vetch and oat vs. corn silage (pp. 79–81).—The crops from 2 plats of oats and hairy vetch and 2 of oats and peas were harvested and ensiled together, no effort being made to keep the different kinds separate. This silage was fed out to the herd between October 7 and November 17. Analyses of the materials as put in the silo are given, together with a brief record of the herd while the silage was fed.

> "Nearly 7 lbs. more butter were produced by these 6 cows fed 6 weeks on pasture with ensiled oats, vetches, and peas than was made in the 6 weeks immediately preceding, on pasture, old silage, and fresh fodder corn, and nearly 40 lbs. more in the 6 weeks immediately following, when corn and rye silages were eaten.
>
> "It is not claimed that this is a strictly controlled experiment, but it serves to show that oats and vetch, and oats and peas, ensiled, may be expected to produce at least as good returns at the milk pail and in the churn as will corn silage."

Feeding trials with animals, F. E. EMERY (*North Carolina Sta. Bul. 109, pp. 419–449*).

The effect of cotton-seed hulls and meal as cattle food (pp. 419–424).—A discussion is given of the general character and feeding value of cotton-seed hulls and cotton-seed meal, and a review of the results obtained in a number of experiments, principally at the station, in feeding these materials in various combinations to steers and cows. From the experience at hand, rations containing these materials are suggested for fattening and for milk.

> "Where it is desirable to feed an animal just sufficient to maintain it without loss, the following rations may be used: Hulls from rather green seed may be fed alone, the particles of seed kernels remaining accidentally with the hulls being counted on for maintenance, or, perhaps, even for slow fattening. . . . With well cleaned hulls, however, some cotton-seed meal must be used, depending somewhat on the animal fed. . . . Probably 8 or 10 lbs. of hulls to 1 lb. of meal, when fed in quantity (as much as can be eaten clean), will support life and maintain the weight of neat stock.
>
> "For slow fattening rations ranging from 7 of hulls to 1 of meal down to 5 or 4 to 1 may be used, depending on the animals fed and skill of the feeder. . . .
>
> "Rations for making good beef quickly may range from 4 to 1 down to 2 to 1, or even 1.5 to 1, as we have fed steers successfully on the latter ration. . . .
>
> "When a cow has passed about 4 or 5 months of gestation, and the flow of milk has greatly diminished, she may be put on a ration of hulls and meal, which may be varied from 4 to 1 to as much as 7 or 8 to 1 of hulls to meal until she has dried off. This will support the cow well. It would be well all this time, however, to be feeding once per day some hay, stover, straw, or let her graze part of each day. For 2 or 3 weeks before calving, the cow's ration should be changed by substituting a succulent diet or bran for the cotton-seed meal."

Cotton-seed meal as a horse food (pp. 425, 426).—Two horses were fed in the first period a ration of clover straw (chaff), corn meal, and ship stuff, on which one horse gained and the other lost in weight. During the second period corn meal and ship stuff were both reduced 1 lb., and 2 lbs. of cotton-seed meal fed instead. During this period both horses gained in weight; there was "an almost regular advance in body weight." In the third period the cotton-seed meal was increased to 3½ lbs. and the clover straw was changed to timothy hay. Neither horse ate the timothy hay well and the period lasted only 8 days.

> "Neither horse showed any symptoms to indicate that the cotton-seed meal disagreed with it, but both objected to late-cut timothy hay after crimson clover straw and chaff. . . .
>
> "Later, in reply to an inquiry, Mr. E. d'Alinge, of the Biltmore estate, writes that he has for some time been feeding 2 lbs. per day, except Sundays, to work horses and mules. The ration, with cotton-seed meal in this case, being as follows: 13 to

15 lbs. cut hay and finely cut corn fodder, 4 lbs. wheat bran, 2 lbs. cotton-seed meal, 6 lbs. corn meal; the whole mixed together. On Sundays a change is allowed to whole grain, oats and corn, and uncut hay."

Cotton-seed meal for pigs (pp. 426, 427, 433–436).—Two pigs, weighing about 90 lbs. each, were fed the same ration, except that one received corn meal and the other an equal amount of cotton-seed meal.

"As the result of feeding cotton-seed meal, it may be stated that 4 oz. were fed per day with 32 oz. of wheat bran for 20 days, and 20 oz. per day of cotton-seed meal with 40 oz. of wheat bran for the following 21 days were fed and nearly all consumed by a hearty pig, without faltering; but when 2 lbs. per day were fed, the pig refused to eat so much, and became sick on what was eaten, but recovered on a corn diet. . . .

"Later a little more cotton-seed meal was fed, but, rather than risk the loss of the pig, it was dropped. After feeding a period on corn meal, both were slaughtered and comparisons of live and dressed weights were made. The pig which was fed on cotton-seed meal weighed 25 lbs. less than the other, and dressed 71.21 per cent of live weight. The pig fed on corn meal dressed 73.68 per cent of live weight."

Cotton-seed meal for calves (pp. 427, 436–439).—Three calves were fed skim milk to which one fourth to one half a pound of cotton-seed meal was added. After feeding a month or a month and a half all of the calves died.

"The death of one was due to licking up or eating sand. The other two are supposed to have been victims of some toxic agent in the cotton-seed meal which powerfully affects the nervous system. This apparently attacked three mature cows, probably causing the death of one."

Feeding skim milk to lambs (p. 428).—Ten lambs were fattened on skim milk with wheat bran, oats, corn, and green clover. All of the lambs were very wild. The tabulated financial result shows that "not only was nothing received for the separated milk which was fed, but there was a loss on the other food eaten."

A pig feeding test (pp. 428, 429, 440–447).—Four pigs, weighing from 75 to 100 lbs., were fed in 10-day periods to test 5 different rations composed of wheat bran, cowpea meal, and corn meal mixed in different proportions. The rations for all the pigs were the same except that the food for one was mixed with a little hot water and allowed to stand from one feeding to the next; for another was mixed to a thin slop; for a third was mixed with cold water, and for a fourth fed dry. Skim milk or buttermilk was added to the food. The results of the trial are fully tabulated.

"The addition of sufficient cold water to the grain to make the ration sloppy gave the poorest result in gain, while the dry food gave the best result.

"As to the result of the feeding, the gain in weight paid for the value of the grain fed, and paid also for the separated milk for the 50 days' feeding, from 1.4 cts. to 2.03 cts. per gallon. During the last 50 days there was not enough gain in live weight to pay for the grain fed, and consequently nothing was received for the milk."

A system of feeding young calves (pp. 429, 430, 448, 449).—Receipts are given for foods used at the station for young calves in changing from cows' milk to skim milk. These consisted for the most part of whole milk, skim milk, and linseed meal in different proportions.

Fattening mature steers on cotton seed and cowpea hay, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 3–11*).—Two half-grade 3-year-old steers were fed in box stalls for 90 days, beginning January 23. Both received whole cotton seed and cowpea hay, the amount being 13.6 lbs. of seed and 20 lbs. of hay per steer. The steers gained 270 lbs. and 274 lbs., respectively. They were bought at 2 cts. per pound and were estimated to be worth 3½ cts. at the close of the trial. With cowpea hay at $3 per ton and cotton-seed meal at $5, there was a profit of $21.30 for the 2 steers.

"Two small 1½-year-old steers were fed for 35 days in the experiment in exact manner of the 2 large steers. They showed no bad effects whatever from the seed, and made a daily average gain of 3.1 lbs."

Raising dairy bred calves, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp. 82–92, fig. 1*).—This experiment was made to compare the cost of raising calves on whole milk, and on skim milk supplemented by flaxseed meal, and to note the effects of these 2 rations on the thriftiness of the calves. Nine calves were used, 1 being fed on whole milk during a period of 60 days, while 8 were gradually changed to skim milk and flaxseed meal. The time covered by the trial varied from 12 to 24 weeks with the different calves. The food eaten, gain in weight, and cost of the food per pound of gain are tabulated for each animal, and an analysis is given of the flaxseed meal. The following table gives a general summary of the results:

Summary of feeding experiments with calves.

	Length of trial.	Cost of food.	Weight at end of trial.	Gain in live weight.		Cost of food per pound of gain.
				Total.	Average per day.	
	Days.		*Pounds.*	*Pounds.*	*Pounds.*	*Cents.*
Calf No. 1, whole milk diet	61	$13.88	245	160	1.90	9.69
Calf No. 2, skim milk diet	84	3.48	160	100	1.19	3.49
Calf No. 3, skim milk diet	140	5.07	234	179	1.28	2.88
Calf No. 4, skim milk diet	140	4.82	205	133	.95	3.84
Calf No. 5, skim milk diet	140	5.10	235	150	1.07	3.51
Calf No. 6, skim milk diet	168	6.58	257	192	1.14	3.47
Calf No. 7, skim milk diet	168	7.32	420	338	2.01	2.40
Calf No. 8, skim milk diet	168	5.33	270	210	1.25	2.54
Calf No. 9, skim milk diet	168	6.55	265	193	1.14	3.71
Average for calves fed on skim milk	....	....	....	....	1.25	3.23

"While the experiment was fairly satisfactory as to the general growth of the calves, the details in feeding were not as carefully carried out as the importance of the work required. It is therefore being repeated with a view of obtaining more accurate data, though it can hardly be expected that our efforts will result in growing a finer lot of calves."

Effect of weather on the quantity and quality of milk, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 88–92*).—Observations on this subject have previously been reported by this station in the Annual Reports for 1891 and 1892 (E. S. R., 4, p. 491; and 5, p. 322). In addition to these tests observations are here reported on two other tests. The first of these was with 17 cows and extended from September 15 to early in November. The cows were at pasture but were stabled during the night. The cows were grouped according to the quality of their milk, and samples of the morning's and night's milk of each group were tested daily with the Babcock test and lactometer. Opportunity was afforded for 72 comparisons of the effect of changes of temperature on percentages of total solids and fat in the milk.

"In cases of general rising quality no connection with weather could be traced. The amount of change was as great one way as another.

"During stationary temperatures, more or less quality fluctuations occurred, but they were found to be equally divided in direction.

"In brief, it may be said that more than half (55 per cent) of the changes in fat percentage, and nearly two thirds (65 per cent) of the changes in per cents of total solids were opposite to those of the thermometer, but that for periods of more than a day the inverse character of the quality change was less marked.

"Coincident with a warm spell [October 15 to 25] the milk flow fell for the first time below the line of calculated natural shrinkage. On the other hand, 5 days averaging as warm (October 3 to 7) were accompanied with a little more milk than usual. There was a marked decrease in quantity early in November, as the weather grew colder."

The other test was with 7 cows stabled in a poorly constructed barn on a bleak hillside, and lasted from February 25 to March 30, 1894. The morning's and night's milk of each cow was tested by the Babcock test. Omitting the times when the temperature varied less than 5° from day to day, there were 40 opportunities for observing the effect of changes of temperature on the milk.

"These show that 21 times the quality change was inverse to temperature change, 13 times in the same direction, and 6 times no quality change followed thermometric fluctuation. Nearly two thirds (62 per cent) of the changes were in the inverse direction to temperature change. They were also more pronounced than the changes in the same direction (0.275 per cent inverse, 0.215 per cent same).

"There were 12 cases of rather decided temperature changes extending over 3 days or more (using both sets of temperatures separately). The general quality of the milk changed inversely 6 times, in the same direction twice, and fluctuated irregularly 4 times. Three quarters of these changes were in the inverse direction."

From a study of the records of the World's Fair test the statement is made that "over half the changes in per cent of total solids, and three quarters of the changes in fat percentages were inverse to thermometric variations. . . . No connection could be traced between temperature and quantity changes (save as high temperature induced lighter feeding and consequent falling off) or between storm, and either quantity or quality change."

The author summarizes the results of the 2 tests previously reported, and taking these in connection with those reported above, draws the following inference:

"These 5 separate tests, covering practically the entire year, and the conditions of pasture, summer soiling, and winter barn feeding, point directly to the conclusion that the tendency of cows is to give from day to day richer milk when the temperature falls and poorer milk as it rises; or, in other words, the quality of the milk (solids and fat) varies inversely to temperature changes."

Cost of butter production in winter, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp. 54–64, figs. 5*).—In connection with the observations on the herd of 23 cows (p. 928), the cost of producing butter in winter was determined for each cow. The cost of the feed was calculated on the same basis as in the yearly record. Each milking was weighed and tested by the Babcock test and the cows were weighed weekly.

> "It was found impossible to make the trial the same length for each cow for the reason that they were not all at the same time in a condition which would make it fair, so each cow was placed on trial at a time when it was thought she would do herself justice."

The trial with different cows lasted between 112 and 181 days. The data given include the average live weight of the cows, the dry matter eaten per day per 1,000 lbs. live weight and per pound of butter fat produced, the butter fat produced per day, and the cost of food per pound of butter fat. These all show very wide variations, the dry matter eaten per 1,000 lbs. live weight varying from 14.60 to 28.24 lbs., the dry matter eaten per pound of butter fat from 18.44 to 31.05 lbs., and the cost of food per pound of butter fat from 10.8 to 17.8 cts.

> "It is evident that some cows produce butter fat much cheaper than others, the variation being so great that under certain conditions one class will produce it at a profit and another at a loss."

The author concludes that it is not a question of the size or breed of the cow, but rather of conformation; and he divides the herd into 4 groups on this basis as follows: (1) Beefy cows, (2) those with less tendency to plumpness, (3) cows spare and angular in form but lacking depth, and (4) cows spare and angular with deep bodies. For each of the cows in these different groups the weight is given, the dry matter eaten per 1,000 lbs. and per pound of butter fat, and the cost of food per pound of butter fat, together with the average for each group. The range of variation and the averages are given in the following table:

Record of butter production by groups.

Groups.	Dry matter eaten daily per 1,000 lbs. live weight.			Dry matter eaten per pound of butter fat.			Cost of food per pound of butter fat.		
	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.	Highest.	Lowest.	Average.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*	*Cts.*	*Cts.*
1. Beef type, blocky and plump	19.96	14.61	16.66	32.47	28.94	31.25	18.2	16.4	17.5
2. Less tendency to lay on flesh	25.15	16.75	21.02	31.05	24.44	26.42	17.8	13.8	15.1
3. Spare and angular, but lacking depth.	23.59	22.09	23.00	28.58	23.75	25.54	16.6	13.4	14.6
4. Spare and angular with deep bodies.	28.24	17.87	23.58	23.06	18.44	21.15	12.9	10.8	12.1

These figures show a steady increase from group 1 to group 4 in respect to the amount of dry matter eaten per 1,000 lbs. live weight, but a decrease in the dry matter eaten per pound of butter fat produced and in the cost of food per pound of butter fat.

"The cost of butter fat as indicated in the last column seems to depend more upon the type of cow than the breed, there being less variation in cost of production between cows of a certain type than between cows of the same breed. The cost of 100 lbs. of dry matter was 57 cts. . . .

"The first group consumed, on an average, 20.81 lbs. dry matter per day, returning 4.7 cts. profit [with butter fat at 25 cts. per pound]; the cows in group 2 ate 20.37 lbs. dry matter and gave 7.5 cts. profit; group 3 ate 19.95 lbs. each and returned 8.1 cts., while group 4 ate 21.86 lbs. each per day at a profit of 13.3 cts., or nearly 3 times as great a net profit as the blocky cows in group 1."

The effect of feeding bone meal on the character of the milk, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 106, 107*).—To observe the effect of feeding bone meal on the ash and phosphoric acid content of milk, 2 Ayrshire cows were fed 2 lbs. each per day of clean ground bone. The milk was tested for ash and phosphoric acid a number of days before adding the bone meal, and for 10 days after the cows had become accustomed to it. The average results for each cow are given in the following table:

Ash and phosphoric acid in milk before and after feeding bone meal.

	Cow Hilda.		Cow Juno.	
	Ash.	Phosphoric acid.	Ash.	Phosphoric acid.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Before feeding bone meal	0.802	0.2142	0.702	0.1809
After feeding bone meal	.809	.2263	.704	.1919
Gain on bone meal	.007	.0121	.002	.0110

"There appeared little difference in the percentage of ash, but its composition seems to have been slightly changed and the phosphoric acid increased."

Effect of the change from barn to pasture, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 107–109*).—Previous observations on this subject have been reported in the Annual Reports of the station for 1889, 1890, 1891, and 1892 (E. S. R., 2, p. 667; 3, p. 477; 4, p. 491; and 5, p. 317). The present observations were on the new station herd of 21 cows. They ate before and after the change a liberal ration of equal parts of corn meal and bran, with hay and silage, and were stabled at night during the pasture period. The milk was tested for 20 days previous to pasture and for the same length of time beginning 10 days after the change. The changes in the milk yield and constituents of each cow in changing from barn to pasture are noted.

"The cows gained in both quantity and quality of the milk, and made more butter on pasture. Out of 21 cows but 2 failed to increase in the milk flow and but 2 lowered its quality as a result of the change.

"The average gain was equivalent to nearly 3 lbs. of milk and nearly a quarter of a pound of butter per day and per cow, while the fat was increased over a third per cent. The quality of milk was increased a seventh, and because of the increase in both the quantity and the quality of the milk, the butter yield was increased nearly a quarter."

The changes noted in the observations previously reported are summarized.

"The evidence appears overwhelming that cows on early pasturage—May and June—make not only more but richer milk than during the last months of their barn life."

Whale flesh meal as a food for milch cows, J. SEBELIEN (*Aas, Norway: 1894, pp. 33*).—A feeding experiment with 20 cows was conducted at Aas Agricultural College to trace the effect of whale flesh meal on milk and butter production. The experiment included 3 main periods, (1) the preparatory period, lasting 32 days; (2) the experimental period proper, lasting 50 days; and (3) the post-experimental period, lasting 20 days. The cows were separated into 2 even lots of 10 each. During the first and third periods both lots were fed a basal ration of 80 kg. of turnips, 90 kg. of cut straw, 40 kg. of hay, 10 kg. each of rape-seed meal, linseed meal, and malt sprouts. Lot A received this ration during the second period also, the quantities fed being somewhat changed; but lot B received 0.5 kg. of flesh meal per head per day during the first 20 days of the second period in addition to the ration in the first period, and later from ½ to 1½ kg. of the concentrated feed in the ration was replaced by a like quantity of flesh meal. The following table gives the average results obtained:

Average daily production of milk and fat per cow.

	Lot A, same feed throughout.			Lot B, whale flesh meal during period 2.		
	Yield of milk.	Fat content.	Yield of fat.	Yield of milk.	Fat content.	Yield of fat.
	Pounds.	*Per cent.*	*Pounds.*	*Pounds.*	*Per cent.*	*Pounds.*
First period	20.08	3.35	0.674	20.13	3.51	0.705
Second period	17.77	3.40	.604	17.97	3.67	.658
Third period	15.67	3.57	.560	15.94	3.64	.580

It would appear that the feeding of flesh meal increased the production of milk and slightly improved its quality. The author concludes that this result will be obtained whether the flesh meal be fed in addition to an ordinary fairly rich ration, or in partial substitution of the vegetable concentrated feeds in the same. If the ration is rather scant and of a narrow nutritive ratio, the addition or substitution of whale flesh meal will produce no increase in the yield of fat, since the milk under such conditions seems to grow thinner, even if the milk yield is increased.

The average live weights of the 2 lots of cows remained nearly unchanged throughout the experiment.

Neither the quality nor the flavor of the butter was apparently affected by feeding as much as 3.3 lbs. of flesh meal per head per day. In a record given of the experience of practical farmers in feeding flesh meal to milch cows, it is stated, however, in one instance that while butter from flesh meal feeding will be faultless when first made, a fishy taste is apt to appear when the butter is kept for some time. The consensus of opinion among farmers is on the whole favorable to the use of whale flesh meal for cows. The quantities fed ranged from 0.4 to 3.3 lbs. per head per day. Flesh meal is also reported as fed to bulls, growing cattle, swine, and poultry with satisfactory results.—F. W. WOLL.

Dairy herd record for 1893, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp. 37–53, fig. 1*).—This is a record for the year 1893 of the 23 cows of the college herd, including the kinds, amount, and cost of food eaten; weight of cows and milk and butter fat produced; percentage of fat in milk; and cost of feed. The herd included the following breeds: Jersey, Holstein, Guernsey, Shorthorn, Polled Angus, and crosses and grades of these breeds. The data are given for each of the cows individually.

"No special effort was made to select an economical ration; the cows were fed bran, barley, corn, linseed meal, silage, roots and hay as had been the practice theretofore."

The milk from each milking was weighed and recorded and a sample taken for testing. The data given are discussed in detail.

"The record of the dairy herd for the year 1893 seems to warrant the following conclusions:

"(1) The average annual cost of keeping a dairy cow is $38.

"(2) A herd of cows bred on dairy lines, well fed and carefully handled, will produce on an average 6,400 lbs. of milk per year at a cost of 62 cts. per 100 lbs. and 12½ cents a pound for butter fat.

"(3) A herd of good dairy cows well fed and carefully handled will produce on an average 300 lbs. of butter fat each per year, which is equivalent to 365 lbs. of butter per cow.

"(4) The average cost of a pound of butter will be 10½ cts.

"(5) Taking the entire herd, the average cost of a pound of butter fat during the winter months is 13.9 cts."

Records of the station herd for 1892 and 1893, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 81–87*).—This is a detailed record for each cow of the station herd for the years 1892 and 1893. The record for 1892 is reprinted with some additions from the Annual Report of the station for 1892 (E. S. R., 5, p. 320).

The record for 1893 includes 21 cows. It shows the number of days the cows were in milk, the total yield and composition of the milk of each cow, the yield of milk constituents, the calculated yields of butter and cheese, the number of pounds of milk required to make 1 lb. of butter and cheese, and the relation between the value of the entire product from butter and cheese. The butter yield is calculated by assuming 110 lbs. of butter to be made from 100 lbs. of butter fat, and the yield of green cheese is calculated by multiplying the per cent of fat by 1.1 and the per cent of casein by 2.5. The summary of the record for 1893 is as follows:

Average per cow for the year 1893.

	Total yield of milk.	Composition of milk.		Yield of milk constituents.			Calculated yield of—		Milk required per pound of—	
		Total solids.	Fat.	Total solids.	Fat.	Casein.	Butter.	Cheese.	Butter.	Cheese.
	Lbs.	*Per ct.*	*Per ct.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Average per cow	6,455	13.68	4.38	883	283	182.0	311	758	20.8	8.5
Average 6 mature Jerseys	6,232	14.73	5.22	918	325	198.2	358	853	17.4	7.3
Average 1 mature Aryshire	8,273	12.31	3.57	1,018	295	194.1	325	811	25.4	10.2
Average 4 Holsteins	8,420	12.80	3.73	1,078	314	208.0	345	865	24.4	9.7
Average 3 best Jerseys	7,197	14.66	5.21	1,055	376	228.9	413	986	17.4	7.3

The yield of the herds for 1892 and 1893 as regards quantity and quality of milk are compared, and the composition of the milk of a number of young cows for the first 2 periods of lactation is compared.

"The regular members of the station herd of 1892 averaged 7,197 lbs. of milk and 351 lbs. of butter, while in 1893 the regular members averaged 7,115 lbs. of milk and 341 lbs. of butter. The entire herd made during the same years 147,609 and 135,615 lbs. of milk and 7,014 and 6,541 lbs. of butter.

"Calculations based on Dr. Van Slyke's work indicate that the regular members averaged 856 and 831 lbs. of cheese, and the entire herd produced milk equivalent to 17,154 and 15,926 lbs. of cheese in 1892 and in 1893, respectively. The poorer record for 1893 was partly due to abortion. There was no material change in the quality of the herd milk for the 2 years and but slight variations in the quality of the milk of the individual cows. The 2-year-olds of 1892 gave the same or slightly better quality of milk during their second lactation. The milk, except that of 2 Jerseys, was found to be worth as much for cheese as for butter, at the average market prices. . . .

"If 2½ lbs. of cheese are considered to be equal in market value to a pound of butter, which are fair market conditions, then for every $100 obtained for the herd milk made into butter there would have been received $98 if the milk had been made into cheese."

Pig feeding, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 30–40*).

Synopsis.—An experiment on 2 lots of pigs of the effect of feeding bulky as compared with more concentrated food during the early growth of the pigs on the general gain in weight, and on the shrinkage of the pigs in dressing. The difference in richness of the rations was brought about by feeding more or less corn meal in proportion to the skim milk. Those on the narrower rations gained faster and ate less dry matter per pound of gain than those on the wider rations, but the shrinkage on dressing was the same with both lots. At current prices the skim milk fed to the pigs was calculated to have brought about 25 cts. per 100 lbs.

Four Chester Whites and 4 Small Yorkshires were selected for the experiment when about 8 weeks old, and divided into 2 lots with 2 pigs of each breed in each lot. After feeding both lots alike for about 3 weeks the experiment was commenced May 30 and continued until December 10 with the Chester Whites and until January 10 with the Small Yorkshires. Lot 1 (bulkier food) received 2 oz. of corn meal per quart of skim milk until they were taking 6 qt. of skim milk, when the additional food required consisted of a mixture of equal parts of corn meal and wheat bran until they weighed 200 lbs., when they were finished off on skim milk and corn meal. Lot 2 was fed on skim milk alone until they took 9 qt. per day, when an ounce of corn meal per quart of skim milk was added until 12 qt. was being taken, when the corn meal was doubled until the pigs weighed 150 lbs. each; they were then given all they would eat of the corn meal and wheat bran mixed, and were finished off in the same manner as lot 1. Soon after the beginning of the experiment the 2 Small Yorkshires in lot 1 died.

The data for the experiment, including the gains in live weight by periods, the amounts of food and of dry matter eaten, financial results, and the loss on dressing, are tabulated. The financial results are based on dressed pork at 7 cts. per pound, corn meal at $21 and bran at $17 per ton, and skim milk at 15 cts. per 100 lbs.

A summary is given in the following table:

Summary of results of pig feeding trial.

Lot.		Average gain in live weight.	Shrinkage in dressing.	Dry matter eaten. Per lb. gain in live weight.	Dry matter eaten. Per lb. gain in dressed weight.	Cost of food per pound of gain in dressed weight.	Average profit per pig.
		Pounds.	*Per cent.*	*Pounds.*	*Pounds.*	*Cents.*	
1	Chester Whites, bulkier food......	264	13½	3.24	3.73	4.83	$4.84
2	Chester Whites, narrower ration .	290	13⅛	3.17	3.64	5.05	5.09
2	Small Yorkshires, narrower ration	211	16	3.33	3.96	5.58	2.62

"The Chester Whites of lot 2, whose ration was narrower than those of lot 1—

"(1) Gained faster,

"(2) Reached a greater live weight,

"(3) Shrank the same, and

"(4) Ate less dry matter to make a pound of live or dressed weight than did the pigs whose food from the beginning was bulkier. Chester White No. 2 of lot 2, however, weighed no more at slaughter than did the Chester Whites of lot 1, notwithstanding it had eaten 75 lbs. more dry matter. This makes the cost of the food of this pig so high and so reduces the profits that the total profit per pig for the 2 lots is nearly the same. . . .

"The Small Yorkshires grew slowly. . . . They gained less in more time, ate more dry matter to the pound of gain in live or dressed weight, and their food cost more per pound of increase of dressed weight than that fed the Chester Whites. . . . They were kept at a profit, yet the money gain from 7½ months of feeding was but little more than one half that derived from a month's less feeding with the larger breed. . . .

"If the manure is considered to offset the care and the cost of gain is subtracted from the price obtained for dressed pork, the skim milk may be considered to have brought 25 cts. per 100 lbs. The fertilizing value of the food was 58 per cent of its market value."

Proper amount of skim milk for finishing off (p. 37).—From October 11 to December 10 lot 1 received 366 qt. of skim milk and 374 lbs. of corn meal each, and the Chester Whites in lot 2 received 732 qt. of skim milk and 339 lbs. of corn meal each.

"The pigs that ate the most gained the most, but . . . the extra 23 lbs. live weight cost $1.93 more, or 8.4 cts. per pound, whereas it only brought 7 cts. This is a reversal of the results found with 8 pigs last year [E. S. R., 5, p. 318], but, as before stated, pig 3 [in lot 2] did so poorly that he lowered the average and the results are less satisfactory than might be wished."

Pig feeding, L. FOSTER (*Montana Sta. Bul. 3, pp. 35–62*).—This is a popular bulletin discussing the principles of feeding, the average composition of American feeding stuffs, feeding standards, and preparation of food, together with quotations from the work of some of the stations in feeding pigs.

Analyses of milling by-products, J. L. HILLS and B. O. WHITE (*Vermont Sta. Rpt. 1893, pp. 26–28*).—Analyses with reference to food constituents and notes on methods of manufacture are reported for the following materials: Corn oil cake, gluten meal, gluten feed, scorched barley, maize feed, middlings, ground peas and oats, oat hulls, "nutriotone," and peanut meal.

What constituents of wine hinder pepsin digestion? H. PETERS (*Ber. pharm. Ges., 4 (1894), p. 258; abs. in Chem. Ztg., 18 (1894), No. 102, Repert., p. 329*).

Comparative examinations of different meat extracts, A. STUTZER (*Ztschr. angew. Chem., 1895, No. 6, pp. 157, 158*).

Cocoa as a food material, H. COHN (*Ztschr. physiol. Chem., 20, No. 1 and 2, pp. 1–27*).—An extended study of the food nutrients of cocoa and their digestibility as shown by the natural and artificial methods. Artificial digestion showed 64 per cent of the nitrogen digestible, including the theobromin. In a digestion trial on the author himself 52.7 per cent of the protein and 95.38 per cent of the fat were digested.

On roasted chicory, E. G. CLAYTON (*Analyst, 20 (1895), Jan., pp. 12–15*).

Heat production in the chick before and after hatching, M. S. PEMBREY, M. H. GORDON, and R. WARREN (*Jour. Physiol., 17 (1894), pp. 331–348; abs. in Jour. Chem. Soc. London (1895), Feb., p. 51*).

On the nature of muscular contraction, T. W. ENGLEMANN (*Nature, 51 (1895), Mar. 28, pp. 519–524, figs. 2*).

Sugar in the nutrition of animals, A. VIVIEN (*Ind. Lait., 20 (1895), No. 13, pp. 99, 100*).

The feeding of animals for the production of meat, milk, and manure and for the exercise of force, LAWES and GILBERT (*Jour. Roy. Agl. Soc. England, 6 (1895), No. 21, pp. 47–146, tables 2*).—The substance of this article will be contained in a bulletin on the Rothamsted Station soon to be issued by this Department.

Compounding rations for animals, P. FAUCOMPRÉ (*Ind. Lait , 19 (1894), No. 48, pp. 382, 383*).

Feeding milk cows with hairy vetch, C. J. MARTIN (*Ind. Lait., 20 (1895), No. 3, pp. 19, 20*).

The influence of the month of calving on the milk production of a cow, P. SCHUPLI (*Einfluss der Kalbezeit der Kühe auf die Milcherzeugung und auf die Aufzucht. Berlin: Pub. by Molkerei Zeitung, 1894; abs. in Fühling's landw. Ztg., 44 (1895), No. 4, pp. 75–80*).

Peanut oil as a substitute for milk fat in calf feeding (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 11, pp. 167–169*).

Measurements of hogs of different breeds, JUNGHANNS (*Mitt. deut. landw. Ges., 1895, No. 5, p. 52, fig. 1*).

Heredity in horses, A. OLIVER (*Bul. Min. Agr. France, 13 (1894), No. 8, pp. 892–907*).

Barnyard fowls R. SAINT-LOUP (*Les oiseaux de basse-cour. Paris: J. B. Baillière et fils, pp. 369, figs. 107*).

Characteristics of breeds of chickens, E. LEMAINE (*Agl. Gaz. N. S. Wales, 5 (1894), No. 12, pp. 878–880*).—A tabulated summary giving number of eggs laid, daily increase in weight of chick, weight when 6 months old, and other data for 33 breeds.

VETERINARY SCIENCE AND PRACTICE.

Glanders, W. L. WILLIAMS (*Montana Sta. Bul. 4, pp. 67–113, pls. 7*).—This is a general discussion on the subject in popular form. Among the topics treated are the pathology, symptoms, and diagnosis of glanders; strangles, pink eye, acute nasal catarrh, infectious or epizootic catarrhal fever, chronic nasal catarrh, diseases of the facial sinuses, diseased teeth, and nostril tumors, which have sometimes been confused with glanders. The only safe method of diagnosis is the use of mallein.

> "Although most modern investigators admit the curability of some cases of glanders, these recoveries are confessedly few and the treatment of the malady, whether by medicines or mallein, is yet purely experimental, unworthy of confidence from a practical standpoint, yet pointing hopefully toward reliable treatment in the near future. Apparent recoveries from glanders are unfortunately too often apparent only, and serve to continue the spread of the disease."

Experimental trichinosis in Spermophilus 13-lineatus, C. W. STILES (*Vet. Mag., 1894, pp. 727, 728; Centbl. Bakt. und Par., 16 (1894), No. 19, pp. 777, 778*).—The disease trichinosis was given experimentally to spermophiles, but the author does not believe that these animals are of any practical importance in transmitting the disease to hogs.—C. W. STILES.

Discussion of the coccidian origin of cancer, FABRE-DOMERGUE (*Ann. Micrographie, 1892, pp. 49–67, 97–110, 145–164, 221–236, 579–587, 603–614, figs. 27*).—The author's conclusions may be summarized as follows: (1) The parasite theory of cancer, originating in the writings of Pfeiffer, Darier, Wickham, and d'Albarran, rests upon observations which have no connection with one another and no analogy; (2) the objects described as *Sporozoa* have only certain morphological resemblances to these animals, but do not possess coccidian characters; (3) all the pseudococcidia as yet described are connected by insensible gradations with the neoplastic cell, from which they originate by degeneration; (4) epithelial cancers of animals, really homologous to those of man, are also not parasitic; (5) in attempting to demonstrate the necessity of a parasitic origin by comparing epithelial cancers with galls of vegetables and infectious neoplasms of animals one fails to recognize the very nature or essence of cancer and compares conditions which are not comparable.—C. W. STILES.

Notes on parasites, C. W. STILES and A. HASSALL (*Vet. Mag., 1894, pp. 729–741, figs. 11*).—*A new species of intestinal fluke* (*Distomum tricolor*) in the cotton-tail rabbit (*Lepus sylvaticus* Bachman) and in the Northern hare (*L. americanus* Erxleben). This species is found to be common in Maryland, the District of Columbia, and Virginia; it stands midway between the genera *Mesogonimus* and *Urogonimus*, and the authors are doubtful as to the validity of these two genera.

Distomum* (*Polyorchis*) *molle (Leidy, 1856, S. and H., 1894).—Anatomical description of original types of *Monostomum molle* Leidy.—C. W. STILES.

New American finds of Sarcosporidia, C. W. STILES (*Vet. Mag., 1894, pp. 928, 929*).—An undescribed species of *Miescheria* is present in the heart of nearly all cattle examined in the District of Columbia; an undescribed species has been found in rabbits in Illinois by Schimer and in Maryland by Hassall; *Sarcosporidia* were found very common in Iowa rats by Stiles; *Balbiaria* sp. found in *Setophaga ruticilla* by Hassall; an undescribed Sarcosporidium found in chickens by Stiles.—C. W. STILES.

On the genus Gongylonema Molin, L. G. NEUMANN (*Mem. Soc. Zool. France, VII, pp. 463–473, figs. 4*).—A general revision of the genus *Gongylonema* (family *Filariidæ*) based upon material from Africa and India. Revised generic and specific diagnoses are given. The following synonymy and data are given for the forms which occur in domesticated animals:

(1) *G. scutatum* (Müller, 1869) Railliet, 1892 (*Spiroptera scutata œsophagea bovis* Müller, 1869; *Filaria* sev. sp. *scutata* Lkt., 1876; *Myzomimus scutatus* Stiles, 1892) recently found by Fayet in 105 out of 136 cattle examined at Tébessa (Algeria); the parasite occurred in nearly every animal infested, in the thoracic portion of the œsophagus. Fayet found the same thread worm in 14 per cent of 494 sheep examined at Tébessa, and Boulant found it in nearly all the sheep slaughtered at Sétif. Fayet also found it in (34=) 32 per cent of the goats examined. It has also been found in the horse (Müller).

(2) *G. pulchrum* Molin, 1857, was found by Fayet in the œsophogeal epithelium of 5 out of 20 hogs.

(3) *G. verrucosum* (Giles, 1892) Neumann, 1894 (sp. *verrucosa* Giles, 1892; *G. scutatum* Railliet, 1894, ex parte), which Railliet believed was identical with *G. scutatum*, is reëstablished as a distinct species. It was found by Giles in India in the epithelium of the stomach of sheep and of the zebu.

The other forms mentioned are *G. musculi* (Rud., 1819) from the mouse (*Mus musculus*); *G. filiforme* Molin, 1857, from *Inuus ecaudatus; G. spirale* Molin, 1857, from *Cervus dama;* and *G. ursi* (Rudolphi, 1819) from *Ursus arctos.*

Neumann's original observations are confined to the species from domesticated animals.—C. W. STILES.

A bibliography, history, etc., of Italian helminthology, C. PARONA (*Atti R. Univ. Genova, 13 (1894), pp. 733, map 1*).—This elaborate work by Parona is divided into four parts: (1) The history of helminthology in Italy; (2) the parasites treated systematically, with cross references to the literature under each group, and a compendium of species arranged according to their hosts; (3) the geographical distribution of the various parasites in Italy; and (4) an almost complete bibliography of Italian works on helminthology, a short abstract of each paper being given. The map gives the geographical distribution of the parasites of man in Italy.

This work represents years of hard labor on the part of Parona, and is one which is absolutely indispensable to all original workers in helminthology.—C. W. STILES.

A test of serum from tuberculous animals as a diagnostic agent for tuberculosis, EBER (*Ztschr. Fleisch- und Milch Hyg., 5 (1895), No. 5, pp. 91, 92*).—No reaction resulted after the serum was employed.

The teeth of the horse, W. G. RIDEWOOD (*Nat. Sci., 6 (1895), No. 38, pp. 249–258, figs. 2*).

DAIRYING.

The composition and analysis of milk and milk products, H. D. RICHMOND (*Analyst, 20 (1895), Mar., pp. 54–56*).—A report on the work done during 1894 in the laboratory of the Aylesbury Dairy Company. The results of analyses of 28,455 samples of milk are summarized by months. The average for the year was 1.0322 sp. gr., 12.67 per cent solids, 3.86 per cent fat, and 8.81 per cent solids-not-fat. "As is usual, the poorest milk is found in the summer and the maximum is attained in November."

The 2,269 samples of cream tested showed an average for the year of 48.9 per cent of fat. The average for 44 samples of clotted cream was: Water 31.59, fat 60.25, solids-not-fat 8.16, and ash 0.69 per cent.

The composition of the 174 samples of butter from different countries was as follows:

Composition of butter as sold in England.

	Water.	Fat.	Solids-not-fat.	Salt.	Ratio of water to solids-not-fat less salt.
French butter, fresh (41 samples):	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	
Highest	14.32	86.08	2.47	0.19	....
Lowest	12.78	84.19	.78	.03	....
Average	13.60	85.05	1.35	.09	9.2
French butter, salted (31 samples):					
Highest	13.57	87.72	4.63	3.29	....
Lowest	9.68	82.98	1.96	.57	....
Average	11.27	85.28	3.45	1.97	13.1
Brittany butter (6 samples):					
Highest	14.81	84.36	2.01	.25	....
Lowest	13.75	83.18	1.78	.09	....
Average	14.26	83.84	1.90	.16	12.2
English butter, fresh (22 samples):					
Highest	15.23	87.62	1.83	1.07	....
Lowest	11.90	84.03	.48	.01	....
Average	13.49	85.70	.81	.14	5.0
English butter, salted (46 samples):					
Highest	16.39	87.65	5.16	4.30	....
Lowest	10.19	79.99	1.90	.90	....
Average	13.11	83.94	2.95	2.11	6.4
Australian and New Zealand butter (6 samples):					
Highest	12.53	89.82	2.59	1.55	....
Lowest	8.24	85.41	1.44	.92	....
Average	10.72	87.21	2.07	1.23	7.9

The analysis is given of the fat of several samples. Analysis of a sample of salted butter when first made and after keeping in a cask for 1 month showed that the percentage of water had diminished from 15.24

when fresh to 11.08, and the salt from 3.96 to 2.61, the conclusion being that the water had run out rather than evaporated.

A contribution to the study of the ash of cheese, G. MARIANI and E. TASSELLI (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 23–26*).—Analyses of the ash of 15 samples of cheese made by different methods are tabulated. The ash of 2 samples gave slightly alkaline reaction, that of all other samples being neutral.

In all samples there was less lime than phosphoric acid, the percentage of phosphoric acid being from 1.07 to 1.75 times that of the lime.

Edam cheese with 77.984 per cent of dry matter contained 5.798 per cent of ash. The percentage of chlorin was 1.591, equivalent to 2.624 per cent of sodium chlorid. The percentage of calcium oxid was 0.787 per cent, and of phosphoric acid 1.38 per cent, the ratio between the two being 1:1.75.

Cheese made from separator skim milk contained 55.243 per cent of dry matter, 7.473 per cent of ash, 2.154 per cent of chlorin (equivalent to 3.553 per cent of sodium chlorid), 1.102 per cent of calcium chlorid, and 1.845 per cent of phosphoric acid, the ratio between the last two being 1:1.67.

The composition of milk and the conditions affecting it, as shown by Bell's analyses, J. F. LIVERSEEGE (*Analyst, 20 (1895), Jan., pp. 7–12*).—The author discusses the analyses of the milk of 273 cows and 55 herds with reference to the milk standard of the English Society of Public Analysts, and with reference to the effect of breed, time of milking, and food on the composition of the milk.

"These analyses show that—

"(1) With 4 very slight exceptions, all the mixed milks are up to the society's standard [8.5 per cent solids-not-fat and 3 per cent fat].

"(2) Only 4 per cent of the milk from the single cows would show signs of much adulteration, as judged by the society's standard, if allowance is made for excess of the other constituents.

"(3) Analyses by the Bell method may give from 0.40 less to 0.26 per cent more than the calculated figures.

"(4) The longer the time between milking the lower will be the fat in milk.

"(5) With the exception of breed, the other conditions have much less effect on the proportion of poor milks."

Note on Recknagel's phenomenon, H. D. RICHMOND (*Analyst, 20 (1895), Jan., pp. 1–3*).—Recknagel, and later Vieth and other chemists, observed that the specific gravity of milk immediately after milking was lower than after standing some time. This Recknagel attributed to a swelling of the casein. The author reviews the subject and refers to some preliminary experiments without giving any details.

"It seems probable that Recknagel's explanation that a change in the casein occurs is correct, and that this is due to an enzyme (possibly the enzyme which causes the changes within the udder); it would appear from this that milk is still a living tissue after secretion. It is probable, then, that fore-milk (*i. e.*, milk that has remained ready formed for some time within the udder) will show much less rise than the later portions (which are drawn away as secreted). Preliminary experiments have shown indications of this being the case."

Investigations of the fat content of milk from individual cows, L. Hansen (*Ugeskr. Landm., 40 (1895), pp. 25–27*).—The author determined the yield of milk, and the percentage of cream in the milk as shown by Fjord's control centrifuge, in case of 6 different herds for a period of 3 years, with the following average results per year:

Average annual record for 6 herds of cows.

Herd number.	Number of cows.	Average annual milk yield per cow.	Average cream content.	Corresponding to fat.
		Pounds.	*Per cent.*	*Per cent.*
1	18	5,867	5.1	3.6
2	16	5,500	5.0	3.5
3	13	5,500	5.1	3.6
4	14	5,867	4.6	3.2
5	11	4,767	4.6	3.2
6	4	5,133	4.4	3.1

Herd No. 1, giving the largest average yield of milk, produced the richest milk, or at least as rich milk as herd No. 3, which yielded 1,100 lbs. less milk per head during the 3 years considered. All herds were well fed and cared for, and most likely of the same breed, viz, the ordinary Danish red breed of milch cows. A detailed statement of the average cost of production of 1 lb. of butter in case of 36 cows is given, the amount of milk, butter, and skim milk and their value, as well as the cost of the feed eaten being noted in each case; the period considered is 1 year. The yields of milk ranged from 3,788 to 10,068 lbs.; of butter, from 121.9 to 394.8 lbs.; and the cost of producing 1 lb. of butter from 12.9 to 30.5 cents.—F. W. WOLL.

Churning experiments, J. L. Hills (*Vermont Sta. Rpt. 1893, pp. 100–106*).

Sweet and ripened cream (pp. 101, 102).—The results are summarized for 33 churnings of sweet cream and 81 of sour cream as follows:

Results of churning sweet and ripened cream.

Condition of churning.	Number of churnings.	Milk taken as cream.[1]	Fat in buttermilk.	Fat in butter.	Curd in butter.	Temperature of churning.	Time of churning.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Deg. F.*	*Minutes.*
Sweet	33	16.8	0.36	81.93	0.66	57	34
Ripened	81	15.1	.24	82.05	.73	57	27

[1] This heading refers to the proportion of the weight of the cream to the weight of the milk from which it was obtained.

The sweet cream butters included 5 made by the butter extractor with an average of 80.03 per cent of fat. The sweet cream butter contained no more curd in these experiments than the ripened cream butter.

"At the same average temperature of churning, the sweet cream took a quarter as long again to churn and lost half as much again of fat in the buttermilk. This may be due in part to the fact that the sweet cream was less concentrated than the ripened cream."

Deep setting and separator cream (p. 102).—A series of 18 churnings with Cooley cream and separator cream, all made by the same butter maker, gave the following average results:

Churning Cooley and separator cream.

Separator.	Number of churnings.	Milk taken as cream.[1]	Fat in buttermilk.	Fat in butter.	Curd in butter.	Temperature of churning.	Time of churning.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Deg. F.*	*Minutes.*
Cooley cream	10	19.9	0.43	80.70	0.66	60	39
Separator cream	8	16.7	.46	82.16	.57	59	35

[1] This heading refers to the proportion of the weight of the cream to the weight of the milk from which it was obtained.

Some of these churnings were made during the summer, which accounts for the high percentage of fat in the buttermilk.

"Both creams were thin, the deep setting cream containing practically one fifth of the milk. There was little difference in time or temperature of churning. The butter made from the deep setting process, however, contained the least fat and the most curd."

Varying concentration of cream (pp. 102, 103).—The results of 110 churnings of cream of different thickness are summarized in the following table:

Churning thick and thin cream.

	Relation of cream to milk from which obtained, by weight.	Number of churnings.	Acidity.[1]	Fat in buttermilk.	Fat in butter.	Curd in butter.	Temperature of churning.	Time of churning.
	Per cent.			*Per cent.*	*Per cent.*	*Per cent.*	*Deg. F.*	*Minutes.*
Very thick	10 to 11.9	6	31.0	0.21	81.73	....	56	14
Thick	12 to 13.9	20	31.0	.23	82.78	....	55	24
Medium	14 to 15.9	35	33.0	.17	82.47	0.67	56	28
Thin	16 to 17.9	27	34.5	.33	82.30	.59	56	30
Very thin	18 to 21	20	35.0	.35	81.03	.66	58	34
Exceedingly thin	32.1	2	49.0	.35	81.82	....	56	68
Thick and medium, average	10 to 15.9	61	32.0	.19	82.50	....	56	25
Thin, average	16 to 32.1	49	35.0	.34	81.88	....	57	33

[1] Expressed in cubic centimeters of tenth normal alkali needed to neutralize 50 cc. of cream.

"Under conditions where there is body enough of cream to ripen well, regardless of concentration, it is probably safe to say that the thicker the cream the better, inasmuch as skimming is as satisfactory, the completeness and time of churning, and quality of the butter is better, a larger proportion of skim milk is delivered to the patron, and vat and churn room and handling are saved."

Varying temperatures of churning (pp. 103, 104).—The results are tabulated for 101 churnings at temperatures varying from 49 to 68° F. At temperatures below 56° F. the average percentage of fat in the buttermilk was 0.17, and the average time of churning 32 minutes; and at temperatures above 56° the average percentage of fat in the buttermilk was 0.33, and the average time of churning 23 minutes.

"A study of the table shows a connection between churning temperature and the results of churning. As the temperature rises, the loss of fat in the buttermilk increases, the cream becomes thinner, the percentage of fat in the butter decreases, and the time of churning shortens. There is no apparent effect upon the percentage of curd in the butter. These points indicate that the proper answer to the often-asked question regarding the temperature of churning is: Churn at the lowest temperature which under the individual conditions will produce exhaustive churning and make a good quality of butter in a reasonable time."

Varying acidities of cream (pp. 104, 105.)—The acidity was determined by Mann's acid test. The results are summarized of 51 trials in which the acidity varied from 27 to 42 cc. decinormal alkali per 50 cc. of cream.

"The only effect of increasing acidity of the cream shown in the table is in the composition of the butter. This again may be due to a thinner cream."

Varying lengths of time in churning (pp. 105, 106).—The results of 91 trials are summarized in which the time of churning varied from 15 minutes or less to 1 hour or more.

"There seems to be no connection between acidity of the cream, the temperature of churning, the curd in the butter, and the time occupied in the operation. The longer churnings, however, were on the thinner creams and lower temperatures, which is in line with the results shown in the table. The effect of lower temperature appears to be to increase the percentage of fat in the butter; of thinner cream, to decrease it, and we find in this case but slight difference between the character of the butter made in less or more than 25 minutes. It is difficult to say which of the factors had the most influence in the slight difference."

Summary (p. 106).—

"(1) In these experiments the per cent of fat in the butter appears lessened by thinning the cream, by an increase in churning temperatures, by an increase in the acidity of the cream, by the lengthening of the time of churning, and by the change from a separator to a deep setting system. There was no marked difference in the fat percentages of sweet and sour cream butters.

"(2) The per cent of curd in butters did not appear to be affected by the length of time or the varying temperatures of churning. The sweet cream butters contained more curd than those made from sour cream, and the deep setting butters more than did the separator-made goods.

"(3) The churnings were most exhaustive with thick and ripened creams at low temperatures, while varying acidities, length of churning, and methods of cream separation showed little effect.

"(4) The conditions most favorable in these experiments to exhaustive churning of a firm (high percentage of fat) butter from separator cream, appeared to be, (1) a thick cream containing 10 to 16 per cent of the original milk; (2) ripened cream, unless churning at 54° or below; (3) a low churning temperature."

Swedish butter exhibitions during 1894, N. ENGSTRÖM (*Tidskr. Landtmän, 15* (*1894*), *pp. 922–926*).—The 248 creameries participating in the Swedish butter exhibitions conducted at Malmö and Gothenburg during 1894 exhibited 880 tubs of butter in all. The average water content of all samples of butter was 13.87 per cent, the range being from 9.13 to 20.22 per cent; 659 samples, or 74.9 per cent, contained between 12 and 15 per cent of water; and only 36 samples, or 4.1 per cent, contained more than 16 per cent of water.—F. W. WOLL.

Manufacture of sweet curd cheese, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp. 104–128, figs. 7*).—Detailed directions are given for making Edam and Gouda cheese. Gouda cheese is believed to be the kind best adapted for the home dairy, since "(1) the milk is worked warm, fresh from the cow; (2) it requires less than 2 hours to do the work; (3) the cheese can be cured in a cellar or in any damp, cool place; (4) it is a good keeper; (5) it is nutritious and palatable." The data are given for 25 trials in making Edam cheese, 9 in making Gouda cheese, and 10 in making Emmenthaler or Swiss cheese. These data include the principal conditions of manufacture, and the composition of the milk, whey, and cheese, and in the case of Gouda and Swiss cheese the losses of solids and fat during manufacture.

In the manufacture of Edam cheese there was a loss in the whey of from 5.66 to 7.98 lbs. of solids per 100 lbs. of milk, and from 0.3 to 0.87 lb. of fat. In making Gouda cheese from 42.87 to 47.07 per cent of the solids in the milk and from 7.1 to 12.38 per cent of the fat in the milk were lost in the whey. In making Swiss cheese the loss of solids in the whey ranged from 46.97 to 59.93 per cent and the loss of fat from 16.44 to 20.5 per cent. The whey in making all 3 kinds of cheese frequently contained more than 0.5 per cent of fat. The fat content was especially large in that of the Swiss cheese, where it ranged from 0.74 to 1.01 per cent. In a number of cases whey from making Emmenthaler cheese was run through the separator and the cream ripened and churned. The butter thus obtained scored 91 or 92 points.

> "Whey butter as usually made is a very low grade of goods, selling about on a par with the grade generally termed 'packing stock, poor,' which sells for 10 cts. when extra dairy butter sells at 20 cts. By running the whey through a separator and ripening the cream with good lactic ferment the quality of the butter can be improved 25 to 50 per cent."

Method of preventing mites in cheese, P. B. SEGELCKE (*Fifth Rpt. Danish State Agl. Councilors, 1893, pp. 125, 126*).—The author gives the following method for preventing mites in cheese: The ceiling, walls, floor, and shelving of the curing room are whitewashed several times until the mites are destroyed. The cheese is first placed in a brine bath for 24 hours, and then in the curing room for 14 days, during which time it is wiped off daily. After 14 days it is thoroughly scraped and washed in lime water, placed on shelves, and kept clean; if a layer of slimy mold should again appear, the cheese must again be scraped and washed with lime.—F. W. WOLL.

Miscellaneous notes on handling milk, J. L. HILLS (*Vermont Sta. Rpt. 1893, p. 111*).—To compare the losses in making butter from milk containing large and small fat globules, the milk of 2 groups of cows possessing these characteristics was creamed in cold deep setting, the cream ripened, and churned at 58° F. The percentages of fat in the skim milk, buttermilk, and butter and the mechanical losses are tabulated. "There was but one third the loss in the creaming of the milk containing the larger globules, and in this case there was also less mechanical loss."

The results of creaming milk of cows in different stages of lactation in cold deep setting and by separator are given.

Tests of cream separators, H. P. ARMSBY, W. H. CALDWELL, and L. E. REBER (*Pennsylvania Sta. Bul. 27, pp. 23*).—Tests are reported of the De Laval Alpha Acme, De Laval Alpha Turbine, United States No. 3, and Standard Russian separators. In these tests the number of runs with each machine varied from 4 to 10. The completeness of the separation was determined by weighing and analyzing the milk used and the products obtained so as to keep a close check upon the results. The results of the tests are fully tabulated, together with results of tests made at Vermont and New York Cornell stations, and the results of estimation of the steam consumption of belt and turbine separators are given. The average completeness of separation was as follows:

	Per cent.
De Laval Alpha Acme	98.31
De Laval Alpha Turbine	99.23
United States No. 3	98.08
Standard Russian	97.10

"Under the conditions of our tests, the steam was used very wastefully. Our conditions, however, were not widely different from those of very many small creameries, where a comparatively small and cheap engine is employed for the purposes of the creamery solely. Under such conditions it would appear that simple determinations of the horsepower required to drive a separator are of no practical value to the creamery man, since they furnish no measure of the amount of fuel which he will actually have to burn to operate the machines. . . .

"The comparison of the steam consumption shows that under our conditions the turbine separators were more economical of steam than the belt separators. That is to say, while the turbine uses steam extravagantly, the small engine of the average creamery uses it still more extravagantly, and the introduction of a turbine is likely to result in a saving of fuel. . . .

"The conclusion would seem to be that in small plants where a separate engine must be used for the creamery work a turbine will give the best economy, but that there is a point in the size of the plant were the economy of the belt machine will come to exceed that of the turbine."

Tests of dairy apparatus, J. L. HILLS (*Vermont Sta. Rpt. 1893, pp. 92–100*).—The results are given of tests of a number of different kinds of separators, made in connection with the Vermont Dairy School, and the determination of the power required for running by means of a dynamometer. In most of these trials the cream was ripened and churned to butter. A record is given for the whole process of butter making. The average results with each kind of separator are shown in the following table:

Tests of separators.

Separator.	Number of runs.	Speed in revolutions per minute.	Amount of milk separated per hour.	Horsepower used to separate 1,000 lbs. of milk per hour.	Fat content of— Whole milk.	Fat content of— Skim milk.	Fat content of— Bowl slop.	Proportion of fat in whole milk recovered in butter. Theoretical.	Proportion of fat in whole milk recovered in butter. Actual.
			Lbs.		*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
De Laval Alpha Turbine	4	5,780	1,800	....	4.35	0.06	0.24	98.0	89.3
Jumbo	4	6,925	1,820	1.87	4.27	.21	.13	95.9	....
De Laval Alpha Acme Belt	4	5,550	1,106	.79	4.36	.09	1.65	97.4	90.1
Reid's Improved Danish	5	5,673	2,078	1.83	4.24	.17	.08	96.6	92.6
United States No. 1	3	7,022	1,911	1.37	4.18	.17	.11	96.1	92.8
United States No. 3	3	7,330	600	.61	4.31	.08	.48	....	....
Russian Steam	2	7,066	1,315	....	4.17	.17	.23	....	....
Columbia	2	7,200	285	....	4.49	.05	.15	....	....
De Laval Baby No. 2	1	....	282	....	4.28	.04	.45	....	....
De Laval Baby No. 3	1	6,000	585	....	4.20	.23	1.71	....	....
Victoria	1	6,000	366	....	4.20	.38	....	....	....

The results obtained in this trial are compiled with those obtained previously at this station and at other stations, giving the results of tests of 49 different separators.

Progress in dairying in the last 25 years, W. KIRCHNER (*Deut. landw. Presse, 21 (1894), No. 98, pp. 19, 20*).

Dairy industry in Ireland for 1894, R. GIBSON (*Dairy, 7 (1895), No. 74, p. 34*).

Note on the cause of the decline in quality of Schleswig-Holstein butter and the remedy, H. WEIGMANN (*Landw. Wochenbl. Schles. Holst., 45 (1895), No. 3, pp. 33–36; Molk. Ztg., 9 (1895), No. 4, pp. 46–48*).

Influence of food on the quality of butter, C. SCHINKE (*Braunschw. landw. Ztg., 63 (1895), No. 10, pp. 41, 42*).

By-products of milk: I. Skim milk; II. Skim milk cheese, F. RIGAUX (*Ind. Lait., 20 (1895), No. 3, pp. 17, 18; No. 4, pp. 25, 26*).

Treatment of cream during churning, G. GROTENFELT (*Ind. Lait., 19 (1894), No. 48, pp. 361, 362; No. 49, p. 390; Dairy World, 15 (1895), No. 2, pp. 3, 4*).

The dilution of milk; its control by an examination of the skim milk, LESCŒUR (*Ind. Lait., 19 (1894), No. 34, p. 270*).

Laws relating to milk, butter, cheese, and oleomargarin, (*Rpt. Dept. Agr. New York, 1894, pp. 727–744*).—A digest of the laws of the various States.

Tests of cream separators, F. SCHOTTE and B. MARTINY (*Mitt. deut. landw. Ges., 1895, No. 5, pp. 53–57*).

Modern processes of butter making, L. BOCHET (*Ind. Lait., 20 (1895), No. 12, pp. 89–92; No. 13, pp. 97–99*).

Coöperative creameries, T. L. HÆCKER (*Minnesota Sta. Bul. 35, pp 93–103*).—This article gives detailed directions for organizing and establishing coöperative creameries, copy of articles of agreement and by-laws, and two plans for creamery building and estimates of cost.

Butter faults (*Ind. Lait., 20 (1895), No. 2, pp. 9, 10*).

Relation of bacteria to cheese, G. GROTENFELT (*Ind. Lait., 19 (1894), No. 46, pp. 366, 367; No. 47, pp. 373, 374*).

Studies on rennet, L. BAURY (*Ind. Lait., 19 (1894), No. 44, pp. 349, 350; No. 45, pp. 357, 358*).

Rennet and similar ferments, R. PETERS (*Preisschrift Rostock, 1894; abs. in Jour. Chem. Soc. London, 68 (1894), Mar., p. 80*).

The manufacture of soft cheese, E. RIGAUX (*Ind. Lait., 19 (1894), No. 31, p. 246; No. 32, pp. 255, 265; No. 33, pp. 262, 263; No. 34, pp. 270, 271; No. 35, pp. 278, 279; No. 36, pp. 286, 287; No. 37, pp. 293, 294*).

TECHNOLOGY.

The heating power of Wyoming coal and oil, with a description of the bomb calorimeter, E. E. SLOSSON and L. C. COLBURN (*University of Wyoming Spec. Bul., Jan., 1895, pp. 32, fig. 1*).—Analyses and tests of the fuel value of 54 samples of Wyoming coal, and tests of fuel value of 2 samples of Texas coal, 1 of fat pine knots, 6 of petroleum, and 2 of asphalt are reported and discussed in some detail. The average results of the tests of Wyoming coals were as follows: Calories per gram 6,282, foot-pounds per pound of coal 8,779,000, pounds of water at 212° F. evaporated by 1 lb. of coal 11.7. In case of the petroleum the calories varied from 10,430 to 10,927, the foot-pounds from 14,571,000 to 15,204,000, and the pounds of water evaporated from 19.4 to 22.24. Mahler's calorimetric apparatus is illustrated and described and the principles and methods of calorimetry are explained.

Analyses of maple sugar, sirups, etc., J. L. HILLS and B. O. WHITE (*Vermont Sta. Rpt. 1893, p. 29*).—The percentages of sugar in 21 samples are reported.

Effect of deep and shallow tapping of maple trees (*Garden and Forest, 8 (1895), p. 150*).—Deep tapping gives a much greater flow than when tapped but an inch deep.

Report on experiments in wine making in 1893, E. KAYSER (*Bul. Min. Agr. France, 13 (1894), No 8, pp. 874–884*).

A contribution to the study of the utilization of the refuse of wine making, E. SILVA (*Staz. Sper. Agr. Ital., 28 (1895), No. 1, pp. 5–18*).

AGRICULTURAL ENGINEERING.

Farm drainage, C. L. NEWMAN (*Arkansas Sta. Bul. 32, pp. 33–54, fig. 1*).—A popular discussion of this subject under the following heads: Protection from surface washing (plant cover, hillside ditches, and terraces), and drainage of wet lands (indications of the need of drainage, open ditches, and underdrains or covered ditches), with an appendix describing a homemade terracing instrument.

The artesian wells of southern Wyoming, J. D. CONLEY (*Wyoming Sta. Rpt. 1894, pp. 87–122*).—A reprint of Bulletin 20 of the station (E. S. R., 6, p. 848).

The Harvey water motor, A. A. JOHNSON (*Wyoming Sta. Rpt. 1894, pp. 66–72, figs. 6*).—A reprint from Bulletin 18 of the station (E. S. R., 6, p. 346).

An electric plow, F. BRUTSCHKE (*Fühling's landw. Ztg., 44 (1895), No. 5, pp. 158–165, fig. 1*).

Plows, rollers, fertilizer distributors, and potato planters, RINGELMANN (*Jour. Agr. Prat., 59 (1895), No. 11, pp. 388–393, figs. 8*).—Descriptions of agricultural implements tested.

Heel scrape and scooter, R. L. BENNETT and G. B. IRBY (*Arkansas Sta. Bul. 31, pp. 28–31, fig. 1*).—This implement is described and the character of its work commended.

Agricultural implements, A. DEBAINS (*Les machines agricoles sur le terrain. Paris*).—Separate volumes treat of cultivators, seeders, and harvesting machines.

Proceedings of the Virginia Good Roads Convention held in Richmond, Virginia, October 18, 1894 (*U. S. Dept. Agr., Office of Road Inquiry Bul. 11, pp. 62, fig. 1*).—An account of the proceedings, giving text of remarks, addresses, and papers. Addresses were made by G. L. Christian, president of the Richmond Chamber of Commerce, and S. W. Corbin, president of the State Board of Agriculture, and the following papers were read: "What our bad roads cost us," by C. Coleman; "How to produce the means to build good roads," by J. F. Jackson; "Our highways, their construction and maintenance," by C. E. Ashburner; "The use of convict labor on public roads," by J. Graham, jr.; "Country road bridges," by C. C. Wentworth; "Stone and shell roads," by D. C. Humphreys.

STATISTICS.

Report of the statistician (*U. S. Dept. Agr., Division of Statistics Rpt. 123, n. ser., pp. 58*).—The statistics given in this report relate to the number and value of farm animals in the different States, the cotton crop of 1894, live stock in Great Britain and Ireland, and the cotton crop of India for 1894. The report also contains notice of a French Congress on popular credit, notes on the wheat crop of Victoria (Australia), notes on foreign agriculture, and transportation rates.

Report of the statistician (*U. S. Dept. Agr., Division of Statistics Rpt. 124, n. ser., pp. 59–106*).—This report treats of the distribution and consumption of corn, the consumption of wheat per capita in the United States, the wheat crop of the world, prices of wheat since 1865, wholesale prices of principal agricultural products, report of European agents, and transportation rates.

Reports of director and of treasurer of Vermont Station (*Vermont Sta. Rpt. 1893, pp. 9–16*).—This includes the review of the work of the year by the director, list of bulletins published, and matter of general interest, together with the treasurer's report for the fiscal year ending June 30, 1893. In connection with a revision of the station mailing list by return postal cards which took place during the year, it is stated that "over 95 per cent of the cards were returned, and a large number of names of persons who had died or removed to unknown addresses were stricken from the list."

Report of Wyoming Station for 1894 (*Wyoming Sta. Rpt. 1894, pp. 138*).—This includes a report by the director on the work of the year; treasurer's report for the fiscal year ending June 30, 1894; and brief reports by the agriculturist and horticulturist, physicist, meteorologist, botanist, chemist, and geologist; together with reprints of the bulletins published during the year.

Remarks on the work of the Posen Experiment Station in 1894, M. GERLACH (*Landw. Centbl. Posen, 23 (1895), No. 8, pp. 44, 45*).

NOTES.

Massachusetts Stations.—The two stations in Massachusetts have been united under the name of the Hatch Experiment Station of the Massachusetts Agricultural College. President H. H. Goodell has been elected director pro tem. The reorganization will be completed at the June meeting of the board of control.

Association of American Agricultural Colleges and Experiment Stations.—Notice has been issued that the next annual meeting of the Association will be held at Denver, Colorado, beginning July 16, 1895.

Soil tests in Virginia.—At a meeting of the Virginia State Board of Agriculture, April 10, 1895, called for the purpose of arranging for soil tests in the State, a resolution was reported and approved authorizing the Commissioner of Agriculture, in conjunction with the Committee of Agricultural and Analytical Chemistry of the Board, to expend $500 for conducting fertilizer tests in four different sections of the State, comprising the tobacco, corn, grass, and truck lands, and $1,000 for a preliminary examination of the composition, texture, and relations to moisture and crops of the principal soils of the State, under the advice of the Chief of the Division of Agricultural Soils of this Department.

Four points were selected for experiment, as follows: For bright tobacco, Pittsylvania County, near Danville; for corn, Hanover or Goochland County; for trucks, the peninsula near Williamsburg; for grasses, Augusta County.

Personal Mention.—Dr. J. P. Lotsy, associate in botany at Johns Hopkins University, has accepted the directorship of the botanical gardens of Java.

Dr. A. Morgen, for several years first assistant at the Halle Station, has been appointed professor of agricultural chemistry and director of the experiment station at Hohenheim, Germany, to succeed Prof. Emil von Wolff, who has retired.

Dr. Th. Pfeiffer, chemist to the German Agricultural Society, and formerly connected with the Göttingen Station, under Henneberg, has been elected professor of agricultural chemistry in the University of Jena. He will be succeeded by Dr. J. H. Vogel.

EXPERIMENT STATION RECORD.

Vol. VI. No. 11.

Twenty-six years ago, through the activity of Dr. F. Nobbe, the experiment station for plant physiology connected with the Forestry Academy at Tharand, Germany, offered to assist the farmers in the selection and purchase of seed. The station received an annual grant of about $450 from the Agricultural Society of Dresden to aid in carrying on its work. This was the beginning of the seed control, which from that time until the present has steadily grown in extent and in usefulness, especially in European countries. Its history, present extent, methods of work, etc., are described in detail in an interesting paper by B. Jonsson[1] on the seed control stations of the world, which includes a very complete bibliography of the subject. According to this paper there are now 117 stations in active operation outside of the United States. The different countries are said to be represented as follows: Belgium 9 stations, Bulgaria 3, Denmark 1, England and Scotland 2, France 1, Holland 4, Italy 1, Norway 3, Portugal 3, Roumania 1, Russia 7, Spain 1, Switzerland 2, Germany 38, Hungary 6, Austria 14, Sweden 16, Brazil 1, Japan 1, and Java 3.

In 1877 29 seed control stations were established in Germany, 7 of which were devoted to seed control exclusively, while the rest were combined chemical and seed control stations. The first seed control station in Austria was established in 1870, in Denmark in 1871, in Belgium in 1875, and in Switzerland and Russia in 1876.

The organization and working plans of the different stations vary to suit the individual needs of the work, but the modified plans as suggested by Dr. Nobbe are the basis for all. The methods of the German stations have been fully described in this journal by Dr. Oscar Burchard (E. S. R., 4, pp. 793, 882). In all cases a certain definite sample is required, the size of which depends on the seed to be examined. For the smaller and lighter seeds 100 gm. is required, while for the larger seeds the weight of the average sample must be at least 250 gm. From these samples smaller ones are taken and tested for their purity, germinative ability, and intrinsic worth. The weight of these smaller samples varies from 2 gm. for the smaller and lighter seeds to 50 gm.

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[1] Kgl. Landt. Akad. Handl. Tidskr., 33, pp. 257-286 and 321-372.

for such large seeds as corn, beans, beet seed, etc. The time for germination has been experimentally determined for the different kinds of seed and the germination in a certain definite time of every lot tested is compared with the standard for that kind. The standards for purity, germinative ability, and intrinsic worth vary in different countries, each having its own.

The methods by which the control is secured differ in different countries. In some countries this is brought about through legislative action requiring all seed offered for sale to be up to a certain definite quality. In others the same end is secured by a mutual agreement between the wholesale dealers and the stations, whereby dealers place themselves voluntarily under the control of the station and the station certifies to the quality of the seed placed on the market. In other cases there is a combination of these two methods of control, governmental supervision being provided for local dealers and either private or control contract for those outside the State's jurisdiction. Under the private contract the station has no connection with the consumer, but it simply reports to the wholesale dealer on the qualitity of the seed. Under what is known as the control contract the station certifies to the quality of seed and a copy of this certificate is furnished to every purchaser. Under certain conditions the consumer is allowed a free reëxamination of any seed purchased under the control contract, and if a departure of more than 5 per cent from the guaranty is found the dealer is required to reimburse him.

The first attempt in the United States in seed testing was made at the Connecticut State Station in 1877, and two years later the North Carolina Station equipped itself for such work. At the present time several of the experiment stations are prepared to test samples of seed sent them, but they exert no control over their sale. Systematic effort was commenced by this Department about a year ago to collect information on the commercial side of the seed industry in this country and to study the quality of the seed placed upon the market.

The benefits resulting from the seed control in Europe are apparent in the improvement of the quality of seed in general and in the security which it gives to the buyer. The reports of these stations show that the quality of seed has steadily improved since the introduction of seed control. This is especially true in regard to trueness to name and freedom from weed seeds.

The necessity for seed control in this country is not less than in Europe. It is second only in importance to the control of the sale of commercial fertilizers now exercised so generally in the States where fertilizers are used.

The following is a list of the seed control stations now in active operation in different countries, with the date of their establishment, taken from the article by Jonsson referred to above.

Belgium: Antwerp, Courtrai, Ghent (1875), Gembloux (1875), Hasselt (1878), Liege (1878), Louvain, Mons, Roulers.

Bulgaria: Rustchuk (1892), Sadova (1892), Plevna (1892).

Denmark: Copenhagen (1871).

England and Scotland: London, Edinburgh.

France: Paris (1884).

Holland: Goes (1889), Groningen (1889), Hoorn (1889), Wageningen (1877).

Italy: Modena (1890).

Norway: Hamar, Christiania, Frondhjem.

Portugal: Evora (1886), Lisbon (1886), Oporto (1886).

Roumania: Bucharest (1887).

Russia (including Finland): Helsingfors (1881), Riga (1876), St. Petersburg (1880), Sobieszyn (1892), Tver (1892), Warsaw (1880), Aabo (1881).

Spain: Madrid (1891).

Switzerland: Rüti (1876), Zurich (1876).

Germany: (1) *Prussia:* Arendsee (1879), Bonn (1881), Bremervorde (1876), Breslau (1875), Dahme (1876), Dantzic (1876), Ebstorf (1871), Eldena (1878), Göttingen (1876), Halle (1877), Hildesheim (1878), Insterburg (1877), Kempen (1883), Kiel (1874), Königsberg (1875), Köslin (1893), Marburg (1876), Münster (1871), Posen (1873), Wiesbaden (1881). (2) *Bavaria:* Augsburg, Baireuth (1876), Landshut (1876), Munich (1872), Speyer, Triesdorf (1876), Würzburg (1881). (3) *Saxony:* Tharand (1869). (4) *Baden:* Karlsruhe (1872). (5) *Hesse-Darmstadt:* Darmstadt (1871). (6) *Oldenburg:* Oldenburg (1876). (7) *Brunswick:* Brunswick (1877). (8) *Mecklenburg-Schwerin:* Rostock (1875). (9) *Saxe-Weimar:* Jena. (10) *Alsace-Lorraine:* Rufach (1874). (11) *Bremen:* Bremen (1877). (12) *Hamburg:* Hamburg (State) (1891), Hamburg (private) 1891.

Hungary: Budapest (1882), Debreczin, Keszthely, Kassa, Kolosmonostor, Altenberg (1878).

Austria: Czernislov, Dublany, Feldkirch (1876), Grätz (1872), Kaaden (1877) Neutitschein (1891), Oberhermsdorf, Prague (1877), Prerau (1884), St. Michele (1874), Tabor (1874), Troppau (1892), Vienna (State) (1870), Vienna (agricultural society) (1881).

Sweden: Borås, Falun, Gefle, Halmstad, Hernosand, Jönköping, Kalmar, Christianstad, Linköping, Luleå, Oerebro, Skara, Stockholm, Svalof, Upsala, Westerås.

Brazil: São Paulo (1887).

Japan: Tokyo (1893), with substations.

Java: Kagok-Tegal, Pasoeroean, Buitenzorg.

THE PHYSICAL PROPERTIES OF THE SOIL.[1]

Dr. Ewald Wollny.

PART 3.

IV. THE BEHAVIOR OF THE SOIL TOWARD AIR AND GASES.

THE AIR CAPACITY (OR POROSITY) OF THE SOIL.

This is expressed by the ratio of the volume of the air spaces to the total volume of the soil. The volume of the pores or intergranular spaces varies in natural soils, as we have already seen (p. 764) within wide limits—in the dry state from 20 to 85.3 per cent. In one and the same soil the air capacity depends principally on structural conditions. In the dry state the volume of the air spaces is greater the smaller the particles. Stirring and flocculation increase the volume of the pores generally to a considerable extent, while the pressing together of the soil produces the opposite result. It may be mentioned further that the quantity of air inclosed in a soil decreases as the proportion of stones increases.

With the increase in the quantity of water present the volume of the pores of course decreases, but to a varying extent according to the water capacity. In the moist state clay and humus contain the smallest quantity of air of any of the soil constituents; in fact the air may be entirely absent when these substances are saturated with water. The quantity of air in the wet mass always increases with the quantity of coarse-grained constituents. The influence of water on the volume of the pores is less marked in crumbly than in powdery soils, because in the former the noncapillary spaces are not filled with water. The decrease in the quantity of air due to an increase in the density of the mass is greater in the moist than in the dry condition.

From what has been said regarding the influence of the quantity of water in a soil on the volume of the pores it is plain that the quantity of air in the soil increases during drought and decreases correspondingly with an increased precipitation. The extent of the influence of the soil in this particular is determined by its mechanical structure.[2]

The air inclosed in the soil is seldom stagnant, but is generally in constant motion, causing an exchange of air between the atmosphere and the soil. This motion is due to the variations in atmospheric pressure, temperature, and wind movement.

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[1] Continued from p. 863.

[2] E. Wollny, Forsch. Geb. agr. Phys., 8, p. 371.

THE PERMEABILITY OF THE SOIL FOR AIR.

This property is measured by the quantities of air which pass through the soil, other conditions being the same. Except under special conditions it does not depend upon the volume of the pores, but is influenced primarily by the size of the pores, since the latter determines almost exclusively the resistance offered to the circulation of the air. The permeability necessarily increases as this resistance diminishes, and is therefore smaller the smaller the soil particles, and *vice versa*.

Of the different soil constituents in the dry state, clay is the least permeable to air; and permeability increases generally with the quantity of quartz present. Soils consisting of humus alone behave, when dry, similarly to the coarse-grained sands. In soils made up of constituents varying considerably from one another in the size of the particles, the permeability of the whole mass depends principally on the finest-grained material. The remarkable permeability of most sands can, therefore, be reduced considerably by the admixture of comparatively small quantities of some fine-grained material, such as clay, loam, or marl.

In the case of stratified soils the permeability depends entirely on the finest grained layer, even if the layer is very thin. In a very impermeable soil the permeability is increased to a remarkable extent by the formation of the crumbly structure. With an increase of humidity the permeability of a soil for air diminishes, and more strongly the greater the water capacity of the soil. All soils rich in clay and humus become impermeable at a point below saturation. Crumbly soils have their permeability affected to a very much less degree by an increase in humidity than soils having a separate grain structure. If a soil is wet only in the upper layers the entrance and exit of air is hindered in proportion to the fineness of the grains. In soils rich in clay and humus this may result in absolute impermeability, even with slight precipitation.

If air is forced by pressure through soil, the quantity of air passing is proportional to the pressure, and inversely proportional to the thickness of the layer, so long as the velocity does not exceed 0.05 meter. As soon as this limit is exceeded the volume of air does not diminish as the pressure diminishes or as the thickness of the layer increases, but to a less extent, and *vice versa*.[1]

THE DIFFUSION OF GASES FROM THE SOIL.

The pores of the soil contain, along with atmospheric air and water vapor, different gases, of which carbonic acid is the most important, as it is present in the largest quantities. The carbonic acid is due principally to the decomposition of organic substances. The amount present depends upon the richness of the soil in humus and the rapidity of decomposition, but it is almost always much more abundant in the soil than in the atmosphere. Under these circumstances it is of interest to note that there is a constant movement in the soil atmosphere not due to external influences, but to diffusion, *i. e.*, the tendency for the external and internal gases to come into equilibrium.

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[1] H. Fleck, Ztschr. Biol., 16, p. 42. Erster Jahresbericht der chemischen Centralstelle für öffentliche Gesundheitspflege in Dresden. F. Renk, Ztschr. Biol., 15. G. Ammon, Forsch. Geb. agr. Phys., 3, p. 209. D. von Welitschkowsky, Arch. Hyg., 11. R. Heinrich, Grundlagen der Beurtheilung der Ackerkrume, 1882, pp. 123, 221. E. Wollny, Forsch. Geb. agr. Phys., 16, p. 193.

The diffusion of the carbonic acid (as well as ammonia and other gases) from the soil at a constant temperature depends principally on the sum of the pores of the cross section and not on their size. Hence the absolute quantity of diffused gases is larger the greater the total volume of the pores, and *vice versa.* Every decrease in the volume of the pores, whether due to pressure or to an increase of moisture in the soil, is accompanied by a decrease in the quantity of gas diffused. The escape of carbonic acid into the atmosphere by diffusion decreases with the fineness of the grains of the soil, the compactness of their arrangement, and the greater the water capacity of the soil, and *vice versa.* The quantity of carbonic acid diffused diminishes as the thickness of the soil increases, but to a less extent. In soils which become superficially saturated, and into which water penetrates slowly, the diffusion of carbonic acid is considerably diminished or brought to a standstill.[1]

THE ABSORPTIVE CAPACITY (OR CONDENSATION CAPACITY) OF THE SOIL FOR GASES.

Absorption, in the widest sense of the word, is a molecular phenomenon and includes all those causes which bring about the retention of gas molecules on and in solid bodies. It is only a matter of custom to distinguish between hygroscopicity and gas absorption (absorption in the narrow sense), which are essentially identical phenomena. The retention of the gas molecules is caused by a series of separate processes. These are discussed below.

Surface attraction.—There are on the surface of all solid bodies molecular forces related to adhesion, which attract the nearest gas molecules to the surface of the solid body, and there force them together in a dense, partly liquid or perhaps solid envelope, until an equilibrium is reached which remains undisturbed until the constitution of the surrounding medium changes. This process takes place almost instantaneously and with great energy, so that in the beginning, at least, the whole process of absorption may be attributed to it. It also causes initially a rapid rise of the absorption curve and produces a considerable amount of heat, which gives the impetus to a series of further phenomena.

Molecular penetration.—The attracted gas particles penetrate to a certain extent into the intramolecular spaces of the solid body in much the same way as gases are absorbed by liquids, partly on account of the high pressure to which they are subjected and partly on account of the very fine capillaries. This process takes place more slowly than surface attraction, and ceases when the resistance opposed to the penetration of the gas molecules can no longer be overcome.

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[1] F. Hannen, Forsch. Geb. agr. Phys., 15, p. 1.

Absorption.—Owing to surface attraction, an exceedingly thin layer of liquid is very soon formed over the surface of the solid body, and this layer now absorbs gases. Assisted by the high pressure to which this layer is subjected (Bunsen estimates the pressure at hundreds of atmospheres) its capacity for absorption of gases rises to a degree far exceeding our ideas of such processes. This process may also continue for years before reaching its conclusion (Bunsen).

Chemical reactions.—Leaving out of account simple chemical attractions, which do not belong in the realm of gas absorption, there are widely varying, and under ordinary circumstances for the most part unknown, chemical activities between the molecules of the solid body and those of the penetrating gas. The high capillary pressure together with the disengagement of considerable quantities of heat during the initial condensation bring about and keep in action processes which chemical affinity alone would not cause.

The numerous investigations on this subject have given the following results: All the soil constituents have a not inconsiderable absorptive capacity, which is greatest in the case of humus (and ferric oxid), next highest in clay, and least in quartz. Mixed soils behave as their individual constituents. The absorptive capacity increases in any case with the fineness of the particles, and decreases with a rise of temperature. In the absorption of water vapor from air saturated with moisture the latter law is modified only to the extent that the absolute quantity of water increases with the temperature; in which case the influence of the rise in temperature is almost eliminated by the increase in humidity. If the absolute humidity of the air is constant while the temperature rises the influence is the same as that observed in the case of gas absorption. At a constant temperature the hygroscopicity increases with the relative humidity of the air. If the soil is more than hygroscopically moist the gas absorption we have so far considered is replaced by the absorption of gases in the soil water. Rising temperatures accelerate the condensation process. Gases are in general more easily absorbed the more readily they alter their molecular arrangement and the more easily they decompose.[1]

The significance of the absorptive capacity in relation to the fertility of the soil is often overestimated. Gases capable of increasing the supply of fertilizing material occur only in very minute quantity in the atmosphere or in the soil air. The absorption of oxygen is of most importance, because it is through this means that the soil is capable of supplying the oxygen necessary for the respiration of the plant roots when the supply from the atmosphere is cut off by excessive moisture. The hygroscopic water, which occurs to a considerable extent in many soils, is also of comparatively slight importance for vegetation, because the plants wilt before the quantity of water has fallen sufficiently to make it possible for an absorption of water vapor to take place at all.

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[1] G. Ammon, Forsch. Geb. agr. Phys., 2, p. 1. A. von Dobeneck, Ibid., p. 163. Both these articles contain a complete general review of the copious literature on this subject.

THE COMPOSITION OF THE SOIL ATMOSPHERE.

The air inclosed in the soil differs from atmospheric air principally in containing more carbonic acid, less oxygen, and more moisture. From the well-established fact that the soil atmosphere becomes richer in carbonic acid in proportion to the diminution of its oxygen, in such a way that the volume of carbonic acid and oxygen together remains constant, we must infer that the carbonic acid is the product of processes of oxidation. Of the latter the most important are those connected with the decomposition of organic substances in the soil.

The quantity of carbonic acid in the soil air, which is always greater than that in the atmospheric air, sometimes several hundred times as great, is subject to great variations, which are due (1) to a variation in the quantity of organic matter in the soil, (2) to fluctuation in the rapidity of decomposition, and (3) to differences in the processes by which the carbonic acid can leave the soil.

Concerning the first of these reasons, investigations have shown that the quantity of free carbonic acid is proportional to that of the organic matter only when the latter is small, but that the ratio of carbonic acid to organic matter diminishes when the latter is great. The quantity of carbonic acid may remain constant when that of the organic matter varies, since a high proportion of carbonic acid in the soil air diminishes the activity of the lower organisms taking part in the processes of decay, so that with an increase of organic matter the conditions for decay become less favorable.

The degree of decomposition of the organic substances, and consequently the proportion of carbonic acid, depends principally upon the access of air, moisture, and warmth. The quantity of free carbonic acid increases, other conditions being the same, with the supply of oxygen, up to a certain low limit. This increase, however, is not directly proportional, but is progressive at first, and after passing a certain limit is less than that of the supply of oxygen. The decomposition of organic matter, and hence the production of carbonic acid, rises and falls with the quantity of water in the soil, so long as the access of air is not prevented beyond a certain limit. With an increase in temperature up to about 50° C. the intensity of the decomposition of organic matter and of the production of carbonic acid increases. The resultant action of the above-mentioned factors depends on the fact that the extent of the production of carbonic acid is determined by the minimum factor. From this it follows that the quantity of free carbonic acid, the proportion of organic matter remaining constant, is very variable, depending on the physical structure of the soil, its covering, and on the meteorological conditions. In the case of varying quantities of organic matter, its influence on the quantity of carbonic acid may be diminished or entirely eliminated if the more important factors of decomposition (water and temperature) act in the reverse direction. Further than those already given, general laws to account for the very wide variations mentioned can not be framed. In individual instances the local influences alone decide the result.

In conclusion we may note that carbonic acid can pass out from those strata where it is most copiously produced into layers above and below. Its penetration into lower layers and its escape into the atmosphere probably account for the fact that the proportion of carbonic acid is generally greater in the lower layers of the soil. The sinking of carbonic acid into lower layers and its escape into the atmosphere depend essentially on the physical structure of the soil as a whole and of its separate strata, in that the accumulation of the gas in the pores of the soil is promoted by fineness of grain structure and an increase of humidity, and *vice versa*. The influence of the quantity of organic matter and of the external factors of decomposition on the proportion of carbonic acid in the soil air may, therefore, under certain circumstances, be marked by variations in permeability. Thus a coarse-grained sandy soil, rich in humus, may contain less carbonic acid than a fine-grained soil poor in humus, because in the former case the gas will be given off to the atmosphere very much more quickly than in the latter. Such facts, in conjunction with those already adduced, justify the conclusion that the quantity of free carbonic acid in the soil does not show the intensity of the organic processes nor the quantity of organic matter in the soil.[1]

V. THE BEHAVIOR OF THE SOIL TOWARD HEAT.

As the sources of heat for the soil we must consider the heat of the sun, the heat due to chemical action and absorption of gases, and the internal heat of the earth. The heat of the sun is of primary importance, while the other factors have very slight influence.

The heat resulting from the oxidation of organic matter (decay, slow combustion) is, as a rule, insufficient to cause any considerable rise in the soil temperature. It has been found, however, that with the incorporation of organic manure into cultivated soils the rise in temperature, other things being equal, is proportional to the quantity of manure and (within certain limits) the amount of heat produced by the decomposition of the manure is proportional to the initial temperature and humidity of the soil. The greater the chemical tension and the larger the amount of easily decomposable compounds (especially those containing nitrogen) present in the material applied, the greater the amount of the heat produced, if the porosity and temperature (over 10° C.) are favorable. For these reasons the most energetic liberation of heat takes place, as a rule, immediately after the introduction of stable manure or undecomposed vegetable matter. This persists for a period dependent upon the favorableness or unfavorableness of the external conditions and the quantity and nature of the organic material, and diminishes by degrees until the temperature of the manured and unmanured soil has become the same.

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[1] Boussingault and Lévy, Ann. Chim. et Phys., ser. 3, 37 (1853), p. 1. J. von Todor, Hygienische Untersuchungen über Luft, Boden und Wasser, 1892, 2, p. 106; Vierteljahresschrift für öffentliche Gesundheitspflege, 7, p. 205. M. von Pettenkofer, Ztschr. Biol., 7, 9, 12. G. Wolffhiegel, Ibid., 15. P. Smolenski, Ibid., 13, p. 383. H. Fleck, Jahresbericht der chemischen Centralstelle für öffentliche Gesundheitspflege in Dresden, 2, p. 15; 3, p. 3. Lewis and Cunningham, Ann. Rpt. Sanitary Commission, Government of India, 1874. R. Nichols, Ann. Rpt. Mass. State Bd. Health, 1875, and Rpt. Sewerage Commission, Boston, 1876. E. Ebermayer, Forsch. Geb. agr. Phys., 1, p. 158; Ibid., 13, p. 15. F. Möller, Mittheilung aus dem forstlichen Versuchswesen Oesterreichs, 1, p. 121; Forsch. Geb. agr. Phys., 2, p. 329. E. Wollny, Vierteljahresschrift für öffentliche Gesundheitspflege, 1883; Landw. Vers. Stat., 25 and 36; Jour. Landw., 34 (1886), p. 213; Forsch. Geb. agr. Phys., 3, p. 1; 4, p. 1; 5, p. 299; and 9, p. 165.

The warming effect of the above-mentioned manures lasts from 4 to 12 weeks and amounts to 0.1 to 0.4° on an average, though only when comparatively large quantities of readily decomposable material are used and the circumstances are favorable to decomposition. From these data, and also from the fact that in most cases the amount of heat produced by the quantities of manure ordinarily used or by the decomposition of the humus already present in the soil is scarcely appreciable, it may be assumed that the source of heat in question is of subordinate significance.[1]

Of still less importance is the liberation of heat on the addition of water, or the absorption of gases and water vapor by the soil, inasmuch as the effect thus produced is of only short duration and seldom occurs under natural conditions, since the conditions are not often favorable to condensation.[2]

Very little of the internal heat of the earth is communicated to the soil, owing to the poor conductivity of the earth's crust, and the effect is approximately the same for all soils.

From the above facts it follows that the marked differences observed in the temperature of the soil are brought about only by the heat of the sun, since other sources of heat than those already mentioned do not exist. The effects of the sun's heat are modified principally by (1) the physical structure of the soil, (2) the covering, (3) the position of the soil, and (4) the course of the meteorological elements.

INFLUENCE OF THE PHYSICAL STRUCTURE OF THE SOIL.

For a proper understanding of the rather complicated phenomena connected with the warming of the soil it is necessary to consider separately the different factors concerned.

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[1] F. Wagner, Forsch. Geb. agr. Phys., 5, p. 373.

[2] A. Stellwaag, Ibid., p. 210. J. Breitenlohner, Ibid., 7, p. 208.

The absorptive capacity and emission capacity of the soil for heat rays.—No experiments are recorded regarding the absorptive capacity of the soil for the true heat rays (invisible ultra-red) of the solar spectrum, but the absorption of the visible rays depends on the color of the soil. Assuming the behavior of the dark heat rays to be the same as that of the luminous rays, we can say that the darker the color the more the soil is warmed. The absorption of the luminous rays is of importance, because the proportion between luminous and non-luminous rays is nearly constant in sunlight, the invisible radiation amounting to only twice the visible radiation.

The color of the soil tells us nothing concerning the emission capacity for heat rays. Kirchhoff's law states that the ratio of emission to absorption is the same in all bodies, but only for rays of the same wave length at the same temperature. Soils when exposed to the sun absorb a mixture of rays of every degree of frangibility and temperature, but emit only rays of slight refrangibility (dark rays) and low temperature; therefore the rays absorbed are different from those emitted. From this it follows that emission can not be directly estimated from absorption. So far as we can generalize the results of experiments thus far made along this line, it may be said that the mineral constituents radiate heat better than the organic, and that of the former quartz radiates most perfectly. In natural soils, which generally consist of a mixture of constituents, the differences in radiation capacity are very small. Water radiates heat rays to a greater extent than any of the solid constitutents of the soil. Therefore when much moisture is present the differences which would otherwise occur in the emission of heat disappear almost entirely.[1]

The heat absorbed in evaporation at the surface of the soil.—The heat of the sun absorbed by the soil is lost partly by being communicated to and warming the lower strata of soil, and partly by being rendered latent by evaporation. Loss of heat in the second way increases and decreases, other things being equal, with the quantity of evaporation.

The heat capacity (specific heat) of the soil.—This property, like the water capacity, is most conveniently referred to the volume, and is expressed by the number of units of heat necessary to raise the temperature of a definite volume of the soil 1°, compared with the number required to raise the same volume of water the same interval of temperature, this number in the case of water being considered as unity. The specific heat of the soil in the dry state amounts to one sixth to one third that of water. Of the various soil constituents, quartz has the highest specific heat (0.2919), humus the lowest (0.1647), while clay is intermediate (0.2333). With an increase of water in the soil, the specific heat of course increases; therefore in one and the same soil the specific heat is higher in proportion to the absorptive capacity for water vapor and to the water capacity, and *vice versa.* For this reason the specific heat is greatest in humus, less in clay, and least in quartz, when the relative saturation with water is the same. In soils containing much water the specific heat is greatest when the particles are fine and compactly arranged. The specific heat is also smaller in soils with crumbly structure than in those having separate grain structure, other things being equal.[1]

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[1] A. von Liebenberg, Untersuchungen über Bodenwärme; Habilitationsschrift, Halle, 1875. C. Lang, Forsch. Geb. agr. Phys., 1, p. 379. E. Wollny, Ibid., p. 43; 4, p. 327. J. Ahr, Ibid., 8, p. 397.

The conductivity of the soil for heat.—The temperature of the uppermost layer of the soil is communicated by conduction to the lower layers. The temperatures in the upper and lower layers tend to equalize themselves, but for this a certain length of time is of course required. This circumstance explains a number of phenomena noticed in studying the thermal conditions of the soil.

There is both an upward and downward movement of heat, and it is slowest in humus, quickest in quartz sand, and has an intermediate velocity in clay. Carbonate of lime and ferric oxid have a conductivity for heat intermediate between clay and quartz. In one and the same soil in the dry state the conduction of heat generally increases with an increase in the size of the particles and aggregates. Conduction increases with the proportion of stones and with the compactness of arrangement of the particles. The differences also increase, as a rule, with the quantity of water in the soil. Water increases the conductivity of a soil very considerably, and in proportion to the quantity present, other things being equal.[2]

The soil temperature observed under any given circumstances depends, in as far as it is affected by the mechanical structure of the soil, on the resultant action of all the factors just described. The causes attributable to the soil itself bear such a varied relationship to one another that no satisfactory explanation can be arrived at from average figures for observations covering long periods of time as to the individual factors in different soils. Only the variations in different periods with varying external temperature can be decided. This might be inferred from the fact that, under the same external circumstances, different kinds of soil, in spite of their very different behavior toward variations in heat, show the same yearly average, or differences of only a few tenths of a degree. This is explicable when we bear in mind that differences occurring in separate periods are of such a nature as to counterbalance one another. The thermal conditions can therefore be clearly determined only by taking into consideration the course of the soil temperature.

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[1] W. Schumacher, Physik des Bodens, p. 242. L. Pfaundler, Poggendorff's Annalen, 129, p. 102. H. Platter, Annalen der Landwirthschaft in Preussen, Monatsblatt, 1870, No. 52, p. 52. A. von Liebenberg, Untersuchungen über die Bodenwärme, Habilitationsschrift, Halle, 1875. C. Lang, Forsch. Geb. agr. Phys., 1, p. 109. R. Ulrich, Ibid., 8, p. 1.

[2] F. Haberlandt, Wissenschaftlich-praktische Untersuchungen auf dem Gebiete des Pflanzenbaues, 1, 1875. A. von Littrow, Sitzungsberichte der kaiserl. Akademie der Wissenschaften in Wien, 1875, 61, pt. 2. E. Pott, Landw. Vers. Stat., 22. F. Wagner, Forsch. Geb. agr. Phys., 6, p. 1.

With a rising temperature (during exposure to sunlight by day or during warm seasons) quartz warms up most strongly of any of the soil constituents, then follow in order clay, chalk, and humus. With a falling temperature (during the night or during cold seasons) the heat conditions are exactly the reverse, inasmuch as quartz cools most quickly, humus most slowly, while clay and chalk are intermediate. The reasons for this are to be found principally in the differences in specific heat of the various constituents in the moist state and in their conductivity for heat, as described above.

In soil of the same constitution the warming depends on the nature of the surface, and the size and arrangement of the particles, as well as on the humidity.

With regard to the influence of the nature of the surface we may mention first that drying up of the top layer induces a rise in the soil temperature owing to a reduction in the evaporation throughout the mass but especially at the surface. The superposition of thin layers of a soil which easily dries up (quartz sand) has the same result. If the upper layers of the soil are stirred the temperature is lowered, because the conductivity of the dry layer, owing to the large quantity of inclosed air, is diminished and the fragments lying on top are only partially in contact with the soil below for purposes of conduction. The constitution of the soil being the same, the color has a decided influence down to comparatively great depths. During the warmer seasons, when the radiation is unhindred, the dark-colored soils are warmer. The differences in temperature in dark and light colored soils disappear more or less during colder seasons when the exposure to the sun is imperfect. This influence of color diminishes as the humidity increases, and as the other factors controlling the warming of the soil obtain preponderance. Under greater differences in the physical properties, especially those due to a higher proportion of humus and to a larger capacity for water, the influence of color may be entirely eliminated.

Regarding the warming of the soil as affected by differences in structure, it has been observed that the soil warms up during the summer and cools down during winter more strongly when the structure is coarse. The principal reason of this is that with an increase in the diameter of the particles are connected a decrease in the quantity of water and an increase in conductivity. Crumbly soils are, as a rule, warmer than powdery, but the differences are comparatively slight. On the other hand, an increase in density of the mass of the soil has a very important influence on its temperature, in that an increase of density causes a higher temperature during warmer seasons or with a rising temperature and a lower temperature during colder seasons or with a falling temperature. This difference may be explained by the fact that by the compacting of the soil its conductivity is increased, and to such an extent that the accompanying increased absorption of heat due to evaporation is for the most part eliminated. The presence of stones in the soil results in a greater capacity for heat in consequence of increased conductivity. At the same time a stony soil cools more rapidly than one free from stones when the temperature falls.

The heat conditions of the soil are dependent to quite a remarkable extent on the quantity of water present. During the warm season the temperature of the soil is generally lower when much water is present, because as the absorption of heat by evaporation increases the specific heat also increases. These differences in temperature are the smaller the more the evaporation diminishes and the increased conductivity due to greater humidity can exert its influence. They are, therefore, during the cold season smallest when the exposure to the sun's rays is slight, the air cool, and still the humidity of the air high and the top layer of soil dry. The effect of cooling due to evaporation, external conditions being the same, is the more easily eliminated and counterbalanced the less water the soil contains, the smaller its water capacity, and the more slowly it replaces by capillarity the loss of water from the surface. With regard to differences in temperature of wet and moist soils (maximum 1 to 1.5° C.), it seems unjustifiable to attribute the low productiveness of wet soils to their lower temperature.

In the freezing of water in the soil the phenomenon of supercooling may be noticed. The soil water, under the influence of capillary tension, becomes cooled by frost below its real freezing point without solidifying, but as soon as any impulse is given to its solidification it passes at once into the form of ice. The heat liberated by this change is sufficient to keep the soil at 0° C. until this heat is used up and the temperature of the soil gradually comes into equilibrium with the lower surrounding temperature. The supercooling temperature of soil water seems to be lower as the humidity decreases and as the energy with which the water is held by the soil increases. During continued frost the temperature of the soil falls faster and lower the less the humidity of the soil. Afterwards the differences in the temperature tend to disappear, or are, under certain circumstances, reversed.

The penetration of frost takes place most quickly in quartz sand, more slowly in clay, and most slowly of all in humus. When the soil thaws out its temperature first rises to 0°, and remains constant for some time before it undergoes a further rise in temperature. Thawing takes place most quickly in quartz sand and most slowly in humus, clay being, as usual, intermediate. Frost disappears most quickly when there is least moisture in the soil.[1]

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[1] E. Wollny, Landw. Jahrb., 5, p. 441; Forsch. Geb. agr. Phys., 1, p. 43; Ibid., 2, p. 133; 3, p. 325; 4, pp. 147, 327, and 5, pp. 34, 167. Ebermayer, Ibid., 14, p. 195. A. Petit, Ibid., 16, p. 285.

INFLUENCE OF THE POSITION OF THE SOIL.

The temperature of the soil varies with a change in exposure. A southerly exposure is warmest; then easterly, westerly, and northerly exposures follow in the order named. In the course of the seasons the maximum temperature shows a fairly regularly recurring variation in a southerly exposure. In the winter months (November to April) the maximum is in the southwest, in summer (May to August) in the southeast, in autumn in the south, after which it returns toward the southwest. A southerly exposure is warmer and a northerly exposure colder the greater the inclination to the horizontal. The inclination of an easterly and a westerly exposure has comparatively less influence on the warmth of the soil, but the greater the inclination the warmer is the easterly and the colder is the westerly exposure. The difference in temperature between a northerly and a southerly exposure is considerably greater than between an easterly and a westerly. The difference in temperature between a northerly and a southerly exposure is wider the greater the inclination toward the horizontal. The angle of inclination has a much smaller influence on the differences in temperatures between an easterly and a westerly exposure. The west side is, when only slightly inclined (up to 15°), generally rather warmer than the east side, but when strongly inclined is colder.[1]

INFLUENCE OF THE COVERING OF THE SOIL.

A soil covered with living vegetation or with dead plants (leaves, straw, stable manure, wood, etc.) is warmer during the cold season and cooler during the warm season than an uncovered soil, other conditions being the same. This difference is greatest in summer and winter and least in spring and autumn. When warm periods occur in winter and cold ones in summer, the influence of the covering on the soil temperature is the reverse of that mentioned, at least in the uppermost layers. A bare soil warms up more quickly in spring and cools down more rapidly in autumn than one covered with vegetation or dead plants. Frost penetrates more slowly and to a less depth into the latter than into the former, but, on the other hand, a bare soil becomes free from frost earlier in the spring. The influence of the covering in the warm seasons is more marked as the exposure to the sun's rays is more complete, and *vice versa*. The characteristic action of vegetation is greater the denser and the further developed it is, and of other covers the thicker and more compact the layer. As regards the influence of different crops on the soil temperature, the development of the leafy parts, the closeness of planting, and the length of the period of growth are of most importance.[1]

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[1] F. Kerner von Marilaun, Ztschr. österr. Ges. Meteorol., 6, p. 65; Sitzungsberichte der kaiserlichen Akademie der Wissenschaften in Wien, 1891, C Abtheilung 2a. C. Eser, Forsch. Geb. agr. Phys., 7, p. 100. E. Wollny, Ibid., 1, p. 263; 10, pp. 8, 345.

Soil coverings of mineral matter influence the temperature of the soil in different ways, according to their own thermal properties. Stones, gravel, sand, etc., when in a more or less thick and uniform layer over the soil, as a rule raise its temperature during the warmer seasons, but lower it during the cold season, when the exposure to the sun is slight. The influence of such a covering is generally more marked the darker the color and the more powerful the radiation. Soils having a high water capacity and a light color (clay, marl, chalk) have an effect the reverse of that of stone, gravel, sand, etc., when used as a covering, owing to the much greater loss of heat due to evaporation and the lower absorptive power for the sun's rays.[2]

Snow, as a bad conductor of heat, prevents rapid falls of temperature during the cold season, diminishes variations in temperature, and retards the penetration of frost. When the snow melts these conditions are usually reversed. The soil free from snow warms up more quickly, since it is generally dryer than that covered with snow. The latter also takes longer to become free from frost.[3]

INFLUENCE OF CLIMATE AND WEATHER ON THE TEMPERATURE OF THE SOIL.

The constitution of the soil being the same its temperature depends on the distribution of heat over the surface and also on certain local causes affecting the influence of the sun's radiation. The intensity of solar radiation varies with the altitude of the sun, and therefore decreases with the geographical latitude. For this reason the temperature of the soil decreases from the equator toward the poles, the decrease being more rapid as the 45th parallel is approached, after passing which it is slower. This decrease in soil temperature is, however, not uniform and proportional to the latitude, but exhibits many variations due to difference in length of exposure to the sun's rays, proportion of land and water, and local influences. The longer time of radiation in northern countries during summer causes a relative rise in temperature of the soil, without which the cultivation of the soil there would be impossible. On islands and near the coast the maximum and minimum soil temperatures are not so far apart as in regions remote from the coast. If we take into consideration also the action of numerous local influences (mechanical structure, exposure, inclination, covering of the soil, etc.), it is not surprising that the "isogeothermals" (*i. e.*, lines connecting places having the same average soil temperature) should diverge very considerably from the parallels of latitude.

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[1] E. Ebermayer, Die physikalischen Einwirkungen des Waldes, etc., 1873; Forsch. Geb. agr. Phys., 14, p. 379. E. Wollny, Der Einfluss der Pflanzendecke, etc., Berlin, 1877, p. 15; Forsch. Geb. agr. Phys., 6, p. 197; Ibid., 10, pp. 30, 345; 3, p. 143. A. Müttrich, Beobachtungen der Erdtemperatur an den forstlich-meteorologischen Stationen, 1880. Th. Nördlinger, Der Einfluss des Waldes auf die Luft und Bodenwärme, 1885. E. Ramann, Forstliche Bodenkunde, 1893, p. 96. A. Petit, Forsch. Geb. agr. Phys. 16, p. 285.

[2] E. Wollny, Der Einfluss der Pflanzendecke, etc., 1877, p. 36; Forsch. Geb. agr. Phys., 1, p. 44.

[3] E. Wollny, Der Einfluss der Pflanzendecke, etc., 1877, 11, p. 24. E. and H. Becquerel, Compt. Rend., 92, p. 1253. A. Wosikof, Der Einfluss einer Schneedecke auf Boden, Klima und Wetter. A. Penck, Geographische Abhandlungen, 3 (1889), No. 3. A. Petit, Forsch. Geb. agr. Phys., 16, p. 285.

The yearly, monthly, and seasonal temperature of the soil at the same latitude decreases as the altitude above the sea increases. This lowering of temperature with higher altitudes is greater in the soil than in the air, and is more noticeable in spring and summer than in autumn and winter. In spite of the greater exposure to the sun's rays in high altitudes during the summer the soil temperature is lower than on the plains, because the action of the sun's heat is shorter in duration and radiation of heat and consequent cooling during the night preponderates. Local influences (exposure and inclination, massiveness of the mountains, etc.) give rise under such circumstances to many modifications of the soil heat.

Regarding local influences, it should be noted that the condition of the atmosphere (precipitation and winds), the position and covering of the soil, the presence of bodies of water, etc., may cause numerous changes in the temperature of the soil.

The condition of the atmosphere is of importance inasmuch as the absorption of rays diminishes and the emission of rays increases as the air becomes rarefied and contains dust and water particles. Clouds and mist diminish the absorption and emission. Rain usually lowers the temperature of the soil, because the water is generally cooler than the soil, and also because the evaporation from the surface is increased by wetting. The opposite effect may be brought about in summer when the soil is covered with vegetation and is dried up by previous drought. In this case the precipitation may cause a rise in temperature owing to the improved conductivity for heat due to the moistening. Winds generally produce a lowering of temperature proportional to their velocity because they increase evaporation; and this effect is the stronger in proportion to the moistness of the soil and its capacity for replacing by capillarity the water lost by evaporation. Under some circumstances the temperature of the wind may be very important. Bodies of water may lower the temperature considerably during spring and summer without raising it in autumn and winter, and may therefore cause a moderate lowering of the average temperature of the land in the surrounding region. The influence of position and covering on the temperature of the soil has already been noted. The influence of vegetation, especially of forest growth, on the neighborhood is analogous to that of a body of water.[1]

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[1] C. S. Cornelius, Meteorologie, 1863, p. 113. J. R. Lorenz von Liburnau, Lehrbuch der Klimatologie, Wien, 1874, p. 230. J. Soyka, Der Boden, Leipzig, 1887, p. 135. E. Ebermayer, Die physikalischen Einwirkungen des Waldes, etc., 1873; Forsch. Geb. agr. Phys., 15, p. 385. J. A. Henselé, Ibid., 16, p. 357.

In conclusion, it must not be forgotten that variations in weather are accompanied by similar variations in soil temperature. It is not possible to formulate general laws on this subject, because the relationships are not only very complicated in their nature but are entirely local in character. In as far as it is possible to trace the connection between climate and soil temperature in a particular case, it has been done by K. Singer for the climate of the south Bavarian plain.[1] The results of this investigation may serve to show the conditions concerned and are therefore inserted below.

In the mild winter months, during which the precipitation is plentiful, there is no particular rise in temperature compared with the normal, but rather a fall in the soil temperature, especially in the deeper layers. Mild and dry winters have a tendency to cause the temperature to rise above the normal. The temperature of the soil during a winter of alternate frost and thaw, of which the average temperature is below the normal, shows a tendency to sink unless it is already very low. In the same way, when hard frost follows mild and wet weather in early winter even a covering of snow can prevent only to a slight extent the general lowering of the soil temperature. On the other hand, during a long and severe winter, in which the snow comes to stay in December, the variation of the soil temperature is either confined to the upper layers or does not occur at all.

A warm spring with, as is usual, a considerable amount of precipitation, causes a decided (relative) rise in the soil temperature. When a cold winter with much precipitation is followed immediately by a warm spring, the temperature of only the upper layer rises, while that of the lower layers may fall still further below the normal. In case of much precipitation the soil temperatures remain unchanged compared with the normal during the different spring months. A cold spring, which is generally accompanied by much snow, is associated, as a rule, with a decided lowering of the soil temperature, even to great depths compared with the normal. When the spring weather is cold and dry the relative lowering of the soil temperature is generally slight, if it has not been immediately preceded by periods of particularly large precipitation.

A warm summer is always accompanied by a high soil temperature or a rise. The rise is all the more noticeable when a large amount of precipitation accompanies the high temperature of the air or immediately precedes it. The rise in soil temperature is not much above the normal during the warm and dry summer months. The lowering of temperature always induced by a cool summer does not reach to great depths, scarcely to 4 meters. Those months in which this relative lowering of temperature could be detected down to 6 meters were all very wet.

A warm autumn causes, with few exceptions, a relative rise in the soil temperature. This rise is slight, and may even be changed to a fall when heavy precipitation occurs in late autumn. A low atmospheric temperature is accompanied, in the majority of cases, in autumn by an excess of atmospheric precipitation, and causes then a regular and often considerable fall in the soil temperature. In the less frequent cases of cool and dry autumn months there is, as a rule, only a very slight variation in the soil temperature.

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[1] Beobachtungen der meteorologischen Stationen im Königreich Bayern, 11.

THE DISTRIBUTION OF HEAT IN THE SOIL.

Daily variations.—During the cooler season, when the exposure to the sun's rays is slight, the temperature of the surface of the soil runs parallel to the minimum temperature of the air, but the maximum in the upper layers of the soil exceeds that of the air during the warmer season, and all the more the greater the exposure to the sun's rays and the greater the absorptive capacity of the soil.

The daily variations of temperature are greatest in the top layers, and decrease with the depth, generally disappearing at a depth of 1 meter. Considering the fact that the conduction of heat downward is gradual, it is clear that the extremes of temperature are later in the lower strata than at the surface and in proportion to the depth. The extent of this retardation depends on the physical properties of the soil, especially the conductivity for heat. In general the influences causing variations in temperature at the surface of the soil have less effect in proportion to the depth of the layer under consideration.

Yearly variations.—The yearly temperature variations are of considerable magnitude in the upper layers, decrease with the increasing depth, and finally disappear entirely. The depth at which a constant temperature obtains, or at least a temperature unaffected by the seasons, is dependent upon climatic conditions. In the tropics this depth is about 6 meters and in the temperate zones 20 to 30 meters. All factors which moderate the extremes of temperature, for instance, nearness to the sea, soil coverings of different kinds, etc., diminish also the variations in temperature. Observation teaches that in the temperate zone the variations in soil temperature cease at a depth of about 20 meters near the coast, but at about 30 meters at a distance from the sea. In the warm season the temperature of the soil diminishes on descending, but in the cold season increases with the depth.[1]

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[1] C. S. Cornelius, Meteorologie, 1863, p. 96. J. Soyka, Der Boden. Von Pettenkofer and Ziemssen, Handbuch der Hygiene, Theil 1, Abtheilung 2, Heft 3, 1887, p. 142. J. R. Lorenz von Liburnau, Lehrbuch der Klimatologie, 1871, p. 34. E. Ramann, Forstliche Bodenkunde, 1893, p. 95.

RECENT WORK IN AGRICULTURAL SCIENCE.

CHEMISTRY.

Paris green, composition and adulterations, B. B. ROSS (*Alabama College Sta. Bul. 58, pp. 7*).—The history and character of Paris green are discussed. According to Ehrmann pure Paris green contains 31.29 per cent of copper oxid, 58.65 per cent of arsenious acid, and 10.06 per cent of acetic acid. Analyses are given of 6 samples collected in the State and 1 from a chemical house in New York. Six of the samples showed arsenious acid ranging from 53.13 to 59.71 per cent, "and no traces of adulteration or attempts at adulteration were detected." A seventh sample, although resembling Paris green except in brightness of tint, contained no copper or arsenic. Prussian blue and chrome yellow were found, with a large quantity of inert matter, as clay, chalk, etc.

> "On taking a small portion each of Prussian blue and chrome yellow and mixing with a large quantity of clay or chalk it was found that a product corresponding almost precisely in color to the material examined could be produced, and it was found quite easy to imitate the normal shade of color of Paris green, though the brightness of tint would be lacking. It was estimated that a material of this character could be manufactured at a cost not exceeding 1 ct. per pound, while a high grade Paris green frequently costs above 20 cts. per pound, the fraudulent manufacturer being thus able to dispose of his product at an enormous profit."

The method followed at the station for determining arsenious acid in Paris green is described.

On the determination of the bromin absorption of fats gravimetrically, O. HEHNER (*Analyst, 20 (1895), Mar., pp. 49–53*).—"The present contribution is merely intended as a study and not as a proposed method, although I believe that in some cases it may be found convenient and that it may afford another factor in judging of the constitution of an oil." The process is based on the fact that if bromin is added to an oil without the intervention of a solvent, combination takes place immediately, often with a rather violent reaction, but if diluted with a suitable solvent, as chloroform, the action is moderated but equally complete.

> "I operate as follows in order to obtain the bromo compounds in a state fitted for weighing: A small, wide-mouthed fat flask is carefully weighed, and from 1 to 3 gm. of the fat to be tested introduced into it. These are dissolved in a few cc. of chloroform, and then pure bromin is added, drop by drop, until the bromin is decidedly in excess. Both the chloroform and bromin must be previously tested in a

blank experiment to make sure that they contain no appreciable residue. The flask is then heated on the water-bath till most of the bromin is driven off; a little more chloroform is added, and the mixture again heated, the chloroform vapor helping to drive out the excess of bromin. The addition of chloroform may once more be repeated. The flask and its content are then placed in an air bath regulated for about 125° C. and kept there until their weight is constant; this takes several hours. A little acrolein and hydrobromic acid escape during the drying, and the residue in some cases darkens slightly; in others a clear yellow heavy bromo oil is obtained. Drying at 100° C. does not lead to satisfactory results."

The results are given of a comparison on a number of common oils of the above process with the iodin absorption by Hübl, calculating the bromin absorption into the iodin equivalent by the factor 1.587. "In most cases the iodin figure calculated from the gravimetric bromin absorption is in satisfactory approximation to the Hübl number," but in the case of castor and linseed oils, which contain more oxygen than ordinary oils, "the figures are substantially different."

The determination of lecithin in seeds, E. SCHULZE (*Ztschr. Physiol. Chem., 20, Nos. 1 and 2, pp. 225–232; 3, p. 252*).—A reply to the criticism made by Von Bitto (E. S. R., 6, p. 270), that extraction as prescribed by Schulze (once with ether and twice with alcohol) does not dissolve all of the lecithin, but that to do this requires extraction 30 times with ethyl alcohol or 20 with methyl alcohol. Schulze insists that his method is sufficient provided the material is finely pulverized, and reports some experiments which appear to support his claim. He states further that 2 samples of methyl alcohol bought for the pure article could not be used for the extraction, since they dissolved from seeds other substances containing phosphorous besides lecithin, which were insoluble in ether, and at the boiling point dissolved small quantities of water-free sodium phosphate and potassium phosphate.

Coloring matter in California red wines, W. D. BIGELOW (*Jour. Amer. Chem. Soc., 17 (1895), No. 3, pp. 211–216*).—Ninety-four samples of California red wines were examined with the aid of the reagents commonly employed in the examination of European red wines. The reactions obtained were not always the same as those obtained with European wines; for instance, a gray, or yellowish or orange-gray precipitate or solution was sometimes obtained with reagents which are said to give green or grayish-green with French wines. On the other hand, no reactions were obtained which are said to be characteristic of wines colored with vegetable pigments.—W. D. BIGELOW.

Remarks on the spectrum of argon and of the aurora borealis, BERTHELOT (*Compt. Rend., 120 (1895), No. 12, pp. 662, 663*).

The forms of nitrogen in meat, E. SALKOWSKI and E. GIESKE (*Centbl. med. Wiss., 1894, pp. 833–835; abs. in Chem. Centbl., 1895, I, No. 3, p. 162*).

Investigation of the fat of oats, P. S. MOLJAWKO-WISTOZKI (*Diss. St. Petersburg, 1894; Pharm. Ztschr. Russland, 33, pp. 646, 647; abs. in Chem. Centbl., 1894, II, No. 33, p. 918*).

The transformation of starch into dextrin and maltose, DUCLAUX (*Ann. Inst. Pasteur, 9 (1895), No. 3, pp. 214–223*).—A critical review.

Some ester-like compounds of wood gum and xylose, R. BADER (*Chem. Ztg., 19 (1895), No. 4, pp. 55, 56; No. 5, pp. 78, 79*).

Chemistry of the albuminoids, L. LILIENFELD (*Du Bois-Reymond's Arch. Anat. und Physiol., 1894, pp. 555–558; abs. in Chem. Centbl., 1895, I, No. 4, p. 221*).

Asaprol, a reagent for albumen, albumose, pepton, and pepsin, RIEGLER (*Abs. in Chem. Ztg., 9 (1895), No. 28; Repert., p. 101*).

The coagulation of albuminoids by mechanical means, W. RAMSDEN (*Du Bois-Reymond's Arch. Anat. und Physiol., 1894, pp. 517–534; abs. in Chem. Centbl., 1895, I, No. 4, p. 221*).

Action of oxalic acid on inulin, G. DÜLL and C. J. LINTNER (*Chem. Ztg., 19 (1895), No. 9, p. 166; No. 11, pp. 216, 217*).

Action of diastase on reserve cellulose, J. GRUSS (*Abs. in Chem. Centbl., 1895, I, No. 15, p. 787*).

The solubility of sugar in mixtures of alcohol and water, O. SCHREFELD (*Ztschr. Ver. Rübenz. Ind., 1894, pp. 970–973; abs. in Chem. Centbl., 1895, I, No. 1, p. 69*).

The determination of casein in cow's milk, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 487–496*).—This paper was read before the Association of Official Agricultural Chemists in 1893, and published in full in the proceedings for that year (U. S. Dept. Agr., Div. of Chem. Bul. 38, pp. 109–116), and in *Jour. Amer. Chem. Soc., 15 (1893), No. 11, pp. 635–645.*

Rum analyses, P. H. GREG (*Bul. Bot. Dept. Jamaica, 2 (1895), No. 3, pp. 25–31*).

BOTANY.

Bacteria in agriculture, A. CARON (*Landw. Vers. Stat., 45 (1895), No. 5 and 6, pp. 401–418*).—The author briefly reviews some of the more recent literature relating to the assimilation of nitrogen by the micro-örganisms in the soil.

An estimation was made of the abundance of bacteria in various soils that had been cropped with oats, barley, and rye following wheat, rye, and wheat. There were found 1.5, 2.2, and 2.7 million bacteria per cubic centimeter in the three soils. It was also found that in black fallow, a fallow on which grass had been allowed to spring up prior to plowing under, the number of bacteria increases from spring until autumn, when their maximum number is to be found.

Investigations were conducted to ascertain the vertical distribution of soil bacteria, and it was found that they decrease with the increased depth of the soil from which they were taken, there being 6 million per cubic centimeter at a depth of 20 cm. and only 1.5 million at a depth of 50 cm. in a field examined.

Examinations were made of soil in which various crops, such as grain, clover, potatoes, etc., had been grown, and it was found that where grains were grown there was a decrease in the number of soil bacteria as the season advanced, while there was a constant increase in the case of the other crops. In this the author confirms the observations of Berthelot and Winogradsky[1] that grain crops do best when they follow such crops as legumes, potatoes, etc., or fallow, not only on account of the chemical and physical condition of the soil, but also on account of the presence of greater numbers of soil bacteria, by the aid of which greater amounts of nitrogen are supplied to the growing crop.

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[1] Compt. Rend., 116 (1893), p. 1385.

The author isolated the bacteria from soils on which wheat and clover had been grown, and also from compost, making numerous pure cultures of them. Pot experiments were made to test their influence upon the growth of oats. The pots used were 22 cm. in diameter and each received 40 cc. of a bouillon culture, and all received the same fertilizers and treatment. At maturity the plants grown in the pots receiving the bacterial cultures gave as an average 18.46 gm. grain and 29.9 gm. straw, as compared with 13.26 and 22.14 gm. from the check pots.

Additional experiments were made to test the comparative value of the different kinds of bacteria isolated, the highest yield being secured when *Bacillus 39* was used for inoculating the soil.

In 1893 some field experiments were undertaken with oats in which the seed, prior to sowing, was impregnated with the desired organism by soaking for some time in liquid cultures containing it. The yields of grain from uninoculated seed and from seed so treated were in the proportion of 100:135. In the autumn the field where the oats had grown was plowed and in the spring sown with mustard. The yields of green forage on equal portions of uninoculated and inoculated plats may be represented by the proportion 100:195.

Numerous additional experiments were conducted which in every case gave a higher total yield whenever the soil or culture medium had received an inoculation with some form of soil bacteria.

The author made no attempt to show how the bacterial inoculations influenced the greater growth and productiveness of plants growing in inoculated soil, but he thinks it probable that the isolated bacteria used in the cultures possessed the same power of assimilating free nitrogen that is claimed for ordinary soil bacteria.

Upon some properties of soils which have grown a cereal crop and a leguminous crop for many years in succession, J. B. Lawes (*Agl. Students' Gaz., 7 (1895), No. 3, pp. 65–92, pl. 1*).—On a part of a field which had grown wheat for 39 years the crop was not cut in 1883, but all the grain was allowed to fall and thus reseed the land. No weeds were removed. In the second and third years there were only a few wheat plants, some of them having slender stalks and only one or two small seeds in the ear.

Four years after this field passed out of cultivation there were found growing in it 40 species of plants, and after 8 years more there were 51 species. Leguminous plants, especially *Lathyrus pratensis*, spread and grew luxuriantly.

In striking contrast with this was the paucity of species on an uncultivated field, which, when in cultivation, had been devoted to the continuous culture of beans; when the bean crop failed red clover and barley had been grown for a few years, the clover affording large yields. The vegetation on this field, when uncultivated, consisted of a few tall tufted-growing grasses; white clover growing in a pasture did not cross the border into this field which had borne leguminous crops for so long. For the cause of the luxuriance and variety of vegetation on the plats long devoted to wheat culture and of the scant growth on the field which had long been devoted to leguminous plants the author does not present any explanation which he considers entirely adequate.

On land which for nearly 50 years had not been used for a leguminous crop, but had been devoted to a rotation of roots, cereals, and fallow, yellow trefoil made a strong effort to establish itself among the cultivated crops, and was exterminated with difficulty. "It is quite evident that when the land is kept free from leguminous plant growth matters accumulate in the soil which are highly favorable to these plants. . . . It is tolerably certain that the matter accumulated does not consist of ordinary manure ingredients."

On the distribution of assimilated iron compounds other than hæmoglobin and hæmatins in animal and vegetable cells, A. B. MACALLUM (*Proc. Roy. Soc., 57 (1895), No. 343, pp. 261, 262*).—By means of freshly prepared ammonium hydrogen sulphid the author has demonstrated the presence of iron other than the above in plant and animal cells. Whether chlorophyll contains iron is yet to be demonstrated. Some of the more important facts ascertained by the author's investigations are as follows:

(1) Iron firmly combined is a constant constituent of animal and vegetable chromatin. Another compound, less rich in iron, is found in nucleoli.

(2) The chromophilous substance in ferment-forming cells contains iron, and the cytoplasm of protozoan organisms, which also probably secrete ferments, yields evidence of the presence of a firmly combined iron compound.

(3) A firm compound is present in the chromophilous substance of the cytoplasm of fungi.

(4) Of the non-nucleated organisms, bacteria, owing to their minuteness, have, with one exception, given little evidence of the presence of an organic iron compound; but in the *Cyanophyceæ* the chromophilous portions of the "central substance" contain iron, and iron may be demonstrated in the peripheral granules formed of the so-called cyanophycin.

Histological experiments on the development of mucors, M. LÉGER (*Compt. Rend., 120 (1895), No. 11, pp. 647-649*).

The comparative anatomy of the fruit of conifers, M. RADAIS (*Ann. Sci. nat. Bot., 19 (1894), ser. 7, No. 3-6, pp. 165-368, pls. 15*).

Concerning the plant cell membrane, C. CORRENS (*Pringsheim's Jahrb. wiss. Bot., 26, pp. 587-673; abs. in Bot. Ztg., 53 (1895), II, No. 8, pp. 125-127*).

Plant forming elements, G. ABBEY (*Jour. Hort., 1895, n. s., Nos. 773, pp. 332, 333; 774, pp. 354-356*).—A semipopular article on plant nutrition.

The mineral food required by the lower fungi, I, H. MALISCH (*Sitzungsber. Wien. Akad. Wissensch., 1895*).

Concerning the waste products of plants, G. JAEGER (*Ber. deut. bot. Ges., 13 (1895), No. 2, pp. 70-72*).

Contribution to the chemistry of chlorophyll, VI, E. SCHUNCK and L. MARCHLEWSKI (*Proc. Roy. Soc., 57 (1895), No. 344, pp. 314-322, fig. 1*).

The production of blue and violet coloring matters in plants, C. NIENHAUS (*Schweiz. Wochenschr. Pharm., 33, pp. 3-11; abs. in Chem. Centbl., 1895, I, No. 9, p. 494*).

Concerning the structure and development of the spermatozoa of plants, W. BELLAJEFF (*Flora, 79 (1894); abs. in Bot. Centbl., 52 (1895), No. 2, pp. 50, 51*).

Coöperation of plants, G. CLAYTON (*Internat. Jour. Micr. and Nat. Sci., 5 (1895), No. 26, pp. 209–216*).—A popular discussion of symbiosis.

Root tublercles of leguminous plants, R. BEER (*Sci. Gos., 2 (1895), No. 15, pp. 70–72, figs. 4*).

Recent works concerning the tubercle bacteria of legumes and their fixation of free nitrogen, STUTZER (*Centbl. Bakt. und Par. Allg., 1 (1895), p. 68*).—A résumé.

A parasite valuable to the vine (*Gard. Chron., 17 (1895), p. 493*).—An abstract of a report by Zawodny on the discovery of a Mycorrhiza on grape roots.

Notes upon poisonous plants, B. D. HALSTED (*Garden and Forest, 8 (1895), p. 172*).—Popular notes are given on some of the more common poisonous plants growing in the region of New Brunswick, New Jersey.

List of the forage plants and weeds in the natural meadows of Modenese plain, L. MACCHIATI (*Staz. Sper. Agr. Ital., 28 (1895), No. 2, pp. 81–111*).

FERMENTATION—BACTERIOLOGY.

Concerning a new system of Bacteria, W. MIGULA (*Arb. bacter. Instit. Hochschule, Karlsrhue, 1895, No. 2; abs. in Hedwigia, 34 (1895), No. 2, Repert., pp. 44–46*).—The author proposes a new system of classifying bacteria as follows: I. Family COCCACEÆ, embracing (1) *Streptococcus*, (2) *Micrococcus*, (3) *Sarcina*, (4) *Planococcus* n. gen., (5) *Planosarcina* n. gen.; II. Family BACTERIACEÆ, (6) *Bacterium*, (7) *Bacillus*, (8) *Pseudomonas* n. gen.; III. Family SPIRILLACEÆ, (9) *Spirosoma* n. gen., (10) *Microspira*, (11) *Spirillum*, (12) *Spirochæte;* IV. Family CHLAMYDOBACTERIACEÆ, (13) *Streptothrix*, (14) *Cladothrix*, (15) *Crenothrix*, (16) *Phragmidiothrix*, (17) *Thiothrix;* and V. Family BEGGIATOACEÆ, (18) *Beggiatoa*. The last family provisionally inserted and may not properly belong here.

Thermophilic bacteria, A. MACFADDEN and F. R. BLOXALL (*Jour. Path. und Bact., 3 (1894), pp. 87–99; abs. in Jour. Chem. Soc. London, 1895, Feb., p. 58*).—An account of bacteria which flourish at high temperatures in manures, causing spontaneous combustion, etc.

A study of disinfectants for fecal matter, H. VINCENT (*Ann. Inst. Pasteur, 9 (1895), No. 1, pp. 1–39*).

Bactericidal action of light and air, R. F. D'ARCY and W. B. HARDY (*Jour. Physiol., 17 (1894), pp. 390–393; abs. in Jour. Chem. Soc. London, 68 (1895), Feb., p. 57*).

Effect of sunlight on tetanus cultures, F. F. WESBROOK (*Jour. Path. und Bact., 3 (1894), pp. 70–77; abs. in Jour. Chem. Soc. London, 68 (1895), Feb., p. 58*).

Studies on lactic fermentation, with bibliography, E. KAYSER (*Ann. Inst. Pasteur, 8 (1894), No. 11, pp. 737–784, dgms. 8*).

On the production of phosphorescence by Photobacterium sarcophilum, R. DUBOIS (*Rev. Mycol., 17 (1895), No. 2, pp. 59–64*).

Concerning Spirillum desulfuricans as a cause of sulphate reduction, M. W. BEYERINCK (*Centbl. Bakt. und Par. Allg., 1 (1895), pp. 1, 49, 104*).

The influence of copper sulphate on the fermentation of grape must by Saccharomyces ellipsoideus, F. KRUGER (*Centbl. Bakt. und Par. Allg., 1 (1895), pp. 10, 59*).

A physiological study of acetic acid fermentation and the artificial production of vinegar, F. LAFAR (*Centbl. Bakt. und Par. Allg., 1 (1895), p. 129*).

Microbes as factors in society, M. L. CAPITAN (*Pop. Sci. Monthly, 1895, Jan., pp. 103–109*).—Translation of an address delivered before the Anthropological Society of Paris, December 14, 1893.

METEOROLOGY.

New cloud classifications,[1] A. McADIE (*Phil. Soc. Washington, Bul., vol. 13, pp. 77–86*).—The history of cloud classification is briefly reviewed, and the system of Howard, proposed in 1802 and generally adopted until within a comparatively recent period, and that of Hildebrande, Abercromby, and Köppen, as modified and recommended by the International Meteorological Conference at Upsala in 1894, are explained and criticised, as well as those of Davis and Ley. The first is unsatisfactory in "that, being based purely on appearance, no account is taken of the origin and manner of formation of the cloud."

"Clouds of very dissimilar origin may have a similar appearance. Modern meteorology demands more than a record of the appearance of the cloud. It seeks the meaning of each formation and regards the cloud as an exponent of the physical processes operating in the air and resulting in cloudy condensation. The cloud is primarily valuable not on account of its beauty, but because it makes manifest motion in the atmosphere, which is not otherwise discernible. It outlines to some degree the storm mechanism at different levels in the atmosphere. Making due allowance for the fact that the cloud does not always give the true motion of the current in which it moves, as witness the Table cloud at Table Mountain, it is still, when rightly interpreted, a most significant index of air motion. There is no sound reason why the forecaster should not derive as much information concerning the movements of the air from a cloud map as from a pressure or temperature map. . . .

"[The second] classification takes some account of the cloud's altitude; and in differentiating clouds formed by diurnal ascending currents in calm air, generally of the summer cumulus type, from the clouds formed by widespread general uplifting of the vapor, some of the nimbus formations, this classification takes some account of cloud origin. In both of these directions the new system is preferable to the old; but the criticism can be fairly made that in the matter of cloud origin the new classification does not go far enough. . . .

"In addition to the direction and relative velocity of the cloud (the only conditions which have been thus far recognized or utilized in forecasting), it is demanded of the future cloud classification that it take into account the level in which the cloud is formed and the manner of formation. Some such scheme as the following might be profitably used:

Classification of clouds.

Altitude.	Formation.			
	Cooling by contact.	Mixture.	Ascension.	Electrical and critical.
Up to 250 meters	Fogs—haze, dust, and ground fogs.		Nimbus	
500 meters		Scud		
750 meters	Nocturnal radiation	Stratus	Summer cumuli	Hail clouds.
1,000 meters		Cumulo-stratus	Cumulo-nimbus	Cumulo-nimbus.
1,500 meters		Billows		
2,000 meters				
3,000 meters			Cumulus	
4,000 meters		Cirro-cumulus	Alto-cumulus	
5,000 meters		Cirro-stratus		
Above		Cirrus		

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[1] Read before the Philosophical Society of Washington, March 2, 1895.

"The altitudes have been kept down purposely, because half of the whole amount of vapor in the air is below us at a height of 1,800 meters (less than 6,000 ft.), and it is but fair to assume that the clouds of most importance to us in forecasting are those formed below 2,000 meters. Above 8,000 meters there is practically no water vapor. Most of our clouds are formed under the second heading (mixture), where condensation results from the mixing of two imperfectly saturated currents. Where the mixing is not thorough, but confined to the edges, we have billow clouds; but while mixture is the most common cause of cloud formation, the cloud thus formed is not apt to give heavy rain. Clouds formed under the third heading (ascension), on the contrary, do give heavy rains. Here the cooling is by adiabatic expansion, and the ideal type of this formation is the cloud of the early afternoon in the tropics, with its torrential rain. Under the fourth heading (electrical) the cloud may keep adding to itself because of a very high surface electrification, or a cloud may be in such a critical condition that, as said above, the slightest jar suffices to produce great change. It is conceivable that a cloud-burst may be a sudden change of condition. . . .

"In order to get at the cloud's true meaning we must, in addition to equipping our observers with nephoscope and cloud atlas, have systematic measurements of the cloud height. This is now done at Blue Hill, Upsala, Storlein, and Berlin by means of theodolites and double observing stations. A more direct way, and one which we think is entirely practicable, is to send apparatus up into cloudland by means of kites. This would give us the conditions prevailing at different cloud levels, and the records would not be momentary."

The use of the spectroscope and electrometer in studying clouds is suggested. It is claimed that by means of a sensitive quadrant electrometer the author has been able to "tell of the approach of the cloud while yet far off and by the changes in the potential to roughly map out the sky."

Studies of the upper air,[1] A. L. ROTCH (*Boston Commonwealth, 1895, Apr. 6, pp. 8, pl. 1*).—The composition of the air brought down from the highest levels has been shown to be identical with that at the earth's surface. The pressure is reduced one half for each 3½ miles of ascent theoretically. The temperature toward the limit of the atmosphere must be far below any temperature ever observed at the earth's surface. The history of observations on the upper air by means of balloon ascensions (29,000 ft.), by balloons without aëronauts (over 10 miles), and from the summit of mountains (23,000 ft.) is reviewed.

Measures of the highest clouds (9 miles) have been made trigonometrically at Blue Hill, Massachusetts, and also in Sweden.

"A knowledge of the movement of high atmospheric layers is of great importance for the theory of the general circulation of the atmosphere, and practically for our weather forecasts, since the forces which develop storms have their origin and sphere of action within two or three miles of the earth." Continuous observations of all the elements in the higher atmosphere can only be made on mountains, though the conditions there can only approximate those in the free air. The discussions of observations at such high stations have contributed largely to the rapid progress of meteorology. The first summit station of any importance was established in 1870 on Mount Washington, New Hampshire, (6,300 ft.). Here are experienced the severest weather conditions in the world. At present but two high-level stations are maintained in this country, at Mount Hamilton, California, and at Blue Hill, Massachusetts. The highest station in Europe is at Rochers des Bosses, 1,460 ft. below the summit of Mount Blanc.

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[1] Read before the Boston Scientific Society, March 26, 1895.

The highest in Germany is on Sonnblick (10,170 ft.). The Eiffel tower in Paris has instruments at 980 ft. above the ground. Observations at such stations, however, can never take the place of records in the free air, and we must depend on records from balloons. The first scientific ascension was made from London by Jeffries in 1784. The instruments for making observations in balloons have recently been greatly improved. Berson last year made an ascension to nearly 29,000 ft. He found:

(1) A much more rapid decrease of temperature between 1 and 6 miles than has been assumed for winter.

(2) A rise of temperature in the morning and evening between the earth and 1 mile above it.

(3) A very feeble insolation, a great humidity of the upper strata, and a fine haze which extended to his highest point.

(4) A snowflake structure of the cirro-stratus clouds, formerly thought to be composed of ice crystals.

(5) A great increase of wind, from nearly a calm at the earth to 36 miles per hour at the average height of the balloon.

Kites have been used for determining meteorologic conditions in the atmosphere, and their use has been begun very recently at Blue Hill, Massachusetts.—H. A. HAZEN.

The high flight of the balloon "Cirrus," A. BERSON (*Ztschr. Luftshiffahrt, 1895, Feb. and Mar., p. 73*).—The author gives an account of a second high flight of the "Cirrus," September 6, 1894, and of the ascensions at the same time of the balloons "Phœnix" (70,600 cu. ft. capacity) and "Majestic" (106,000 cu. ft.). The balloon "Cirrus" reached 61,000 ft. (11.74 miles), and brought back a temperature record of −89° F. (−67° C.) at the highest point. Its velocity was 83 miles per hour toward the ENE. It was not found till the last of September, near Wilna, in Russia. The "Phœnix" reached a little over 20,000 ft. and moved at about 38 miles per hour at an average height of 15,000 ft. The lowest temperature was −15° F. (−26° C.). The diminution in temperature for the "Cirrus" was 2.4° F. in each 1,000 ft. of height (44° C. in 100 meters), and that of the "Phœnix" was 4° F. in 1,000 ft. (.73° C. in 100 meters). This is an extraordinary difference and is due in large part, if not wholly, to the increased heat experienced at the very highest point from insolation, although it is highly probable that the temperature does diminish at a slightly less rate in Europe at the higher elevations. The "Majestic" failed to reach any high altitude.

Such experiments, though giving us meager information of the higher regions, are of the greatest value. If it be true that our cold and hot waves extend up to the limits of our atmosphere and are of cosmical origin, then it is of the greatest importance that conditions in them at high levels be observed.—H. A. HAZEN.

Droughts and famines in India, J. ELIOT (*U. S. Dept. Agr., Weather Bureau Bul. 11, pt. 2, Rpt. Internat. Meteorolog. Congress, 1893, pt. 2, pp. 444–459, pls. 2*).—This is a most interesting and exhaustive treatment of all the facts known regarding these terrible visitations. During 122 years there have been 17 famines. Statistics of the 8 intense famines are given, with loss of life and property, or expenditure of money to give relief.

The areas most liable to drought are chiefly in the tropical belt, where the rains are periodic. Prolonged droughts are more frequent in India than anywhere else in the world. The meteorologic features of the Indian monsoon area may be divided into two periods—the northeast monsoon of dry land winds, from January to May, and the southwest monsoon of humid sea winds, from June to December. The southwest monsoon air circulation is caused, at first, by the formation of a low pressure area over northern India in April and May because of a rapid rise in temperature. It is a breaking down of the southeast trades at the equator and an adaptation of their circulation to the changed conditions at the north. The maintenance of the new order is due to a self-contained energy liberated by rainfall rather than to a continuance of the hot weather conditions in the north. The greater part of the rainfall of India (37 in., or 90 per cent.) occurs during this southwest monsoon. Just before this wind begins northern India is one of the hottest and driest areas in the world. Occasionally maximum shade temperatures of 120° and 124° are registered. The relative humidity often falls below 20 per cent, and 1 per cent has been recorded. The variation of rainfall is greater than in any other country. In Sinde the average is 5 in. per year, and in the Khasia Hills there are 500 in., which is the greatest in the world. The range from year to year is very great; at Kurrachi, 0.47 in. in 1872, and 28 in. in 1869; at Jacobabad in 36 years, least 0.72, greatest 12.05 in.

There are three zones of rainfall in India: (1) The arid zone, with less than 15 in. rain in a year. Here cultivation is dependent on irrigation and there are practically no famines. (2) The dry zone, with 15 to 35 in. of rain. Rain sufficient in average years, but prolonged drought leads to great scarcity. (3) The moist zone, with rain 35 to 500 in. It is a singular fact that the rain is most variable where it is smallest in amount and most regular where it is greatest; hence this zone has no famines.

Favorable conditions for crops are as follows: (1) For cold weather crops (wheat, barley, pulse, etc.) a moderate rain in October, to fit the ground for plowing and in order that the moisture may germinate the seed. Occasional light showers, more especially on the higher lands, in order to develop the grain. (2) For hot weather crops of rice, heavy burst of rain for planting, moderate rain during growth, and a burst of rain to fully insure the growth of the ear. (3) For hot weather crops of millets, etc., rather heavy rain at first and occasional rains afterwards are best suited. Breaks of three or four weeks, especially if accompanied by dry, hot winds, are very injurious, and if protracted, fatal.

In north India famine is due either to the failure of two crops in succession, for example, the rain crops (millets and rice), and the cold weather crop, or to the complete failure of one crop after a series of poor seasons.

In the Deccan they are usually due to a more or less complete failure of a southwest monsoon rain throughout, following one or more bad seasons.

In the rice-growing districts the cause is usually an abnormally early end of the southwest monsoon rains.—H. A. HAZEN.

Meteorologic work in Australia, C. TODD (*Adelaide: pp. 25, pl. 1*).—This important paper describes in detail methods and results of meteorological inquiry in Australia. There are given in 7 charts types of weather selected from a larger number, and it is stated that these charts have been sufficiently studied to show what resulting weather is likely to follow, as determined from previous experience. These charts are distributed to all the stations. After the telegrams have all been received on any day and the new chart constructed, the proper type weather map can easily be found which corresponds with this new chart. The only expense then consists in telegraphing to each station the number of the chart which should be displayed for that type.

There is a ridge of high pressure which passes over the extra-tropical or temperate parts of Australia. This is made up of long loops or "highs," being broken up at times by the advance of "lows" from the tropics and northerly extensions of V-shaped low areas from the south. The position of this ridge in winter is 29 or 30° south latitude. North of this ridge are the dry southeast trades, while to the south there is a prevalence of dry northerly winds, varied by strong west and southwest winds as coastal lows pass from west to east, with rain and squalls. On the east coast winter winds are from the west. This wall or ridge plays a very important part in Australian climate. If this lies well to the south then south Australia is dry, while to the north there are frequent rains. If the wall is in the north these conditions are reversed. About 43 high areas pass during the year, with a velocity of about 17 miles per hour. The movement of low areas is much more marked and regular, there being about 60 per year, with a velocity of 25 miles per hour.

Since the interior of Australia is under high pressure, with dry southeast winds, it is often subject to severe droughts, more or less prolonged. The driest portion is in a belt of country from Lake Eyre, or about latitude 30°, to near the northwest coast, which is swept nearly all the year by the southeast trade wind. The climate of the eastern half is more favorable, owing to the more southerly sweep of the monsoon rains. The following is the experience in the past: In 13 years, with the summer pressure above and temperature below normal, the following winter rain was below the average 9 years, above it but once, and exactly average three times. In 9 years, with summer pressure and temperature the opposite of the above conditions, the winter rain was above the average seven times; below only once, and just average once. In other words, "Summer cool, with high pressure; winter dry. Summer hot, with low pressure; winter wet."

The question of seasonal or long range weather forecasts has been seriously considered. The importance of reliable forecasts to the farmer is undoubted, but they must be reasonably accurate and based on positive knowledge or they will be treated with contempt. Long range forecasts are possible only after "the accumulation and intelligent discussion of the necessary data and the correlation of weather conditions over considerable areas of the earth's surface."

> "India is the only country which has attempted anything like a systematic issue of seasonal forecasts. These are mainly based on the amount of snow falling during the previous winter on the Himalayas, and the general character of the weather in India during the five or six months preceding the setting in of the southwest monsoon; the chief objects of the forecasts being to give some idea of the probable rainfall during the ensuing monsoon."

A more uniform publication of observations to enable a better study of the records, and also a fuller discussion of these records year by year is urged. There is also great need of normal isobaric and isothermic charts for each month and the year.—H. A. HAZEN.

The climate of Cordova, Argentine Republic (*An. Ofic. Meteorol. Argentina, vol. IX, Buenos Ayres, pt. I, 1893, pp. 678; II, 1894, pp. 491, pls. 25*).—Of all the South American States, the Argentine Republic is the most progressive in the organization of a climatological system. The above-named publication of nearly 1,200 large quarto pages in 2 parts is devoted, with the exception of a few pages of annual report, entirely to statistics and discussions relating to the climate of one locality. Part 1 contains the records made at Cordova from 1872 to 1892, expressed in daily, decade, monthly, and annual means. From January, 1889, to the close of 1892 the hourly values are recorded. Part II contains the discussion of observations recorded in part I and a record of observations for 1893. Some of the most general results relating to temperature of the air, rainfall, and evaporation for the period from 1873 to 1893 are as follows: *Temperature* (degrees C.)—maximum 41.8, minimum 8.9, average 16.7; *rainfall* (mm.)—maximum monthly 116.5, minimum monthly 4.1, total 703.1; *evaporation* (mm.)—exposed evaporimeter 64.8, protected evaporimeter 31.4.—O. L. FASSIG.

Magnetical and meteorological observations made at the Government Observatory, Bombay, in the year 1893 (*Bombay: 15 (1894), No. 15, pp. 12*).—This volume is the thirty-second of the series, extending the record from 1845 up to 1893. Magnetical and meteorological observations are taken daily at 6 and 10 a. m. and at 2, 6, and

10 p. m., at which time the general atmospheric conditions are noted. Automatic records by magnetographs, barograph, thermograph, pluviograph, and anemograph are made.

The mean annual temperature for 1893 was 78.9° F.; greatest mean daily temperature, 86° (April 16); least mean daily temperature, 68.1° (February 8); maximum temperature, 92.1° (April); minimum temperature, 59.8° (February). Total rainfall, 64.63 in.; number of cloudy days, 118, and greatest daily fall of rain, 4.98 in. (June 20).—O. L. FASSIG.

Origin of cold waves, H. A. HAZEN (*Monthly Review Iowa Weather and Crop Service, 6 (1895), No. 3, pp. 4, 5*).—Data in support of the theory that cold waves originate in the upper region of the air.

On the first mercury thermometer, MAZE (*Compt. Rend., 120 (1895), No. 13, pp. 732, 733*).—The invention of the mercury thermometer is attributed not to Fahrenheit, but to Bouillian, who in the latter part of March, 1859, made comparative observations on an alcohol thermometer and on a mercury thermometer.

On an old French series of thermometric and meteorological observations, MAZE (*Compt. Rend., 120 (1895), No. 13, pp. 731, 732*).

Meteorological record for January and February, 1895 (*Massachusetts State Sta. Bul. 57, p. 1*).—Notes on the weather and a brief summary of observations on temperature, precipitation, and wind movement.

Meteorological observations at Massachusetts Hatch Station, C. D. WARNER and F. L. WARREN (*Massachusetts Hatch Sta. Met. Buls. 73–75, pp. 4 each*).—Daily and monthly summaries of observations during January, February, and March, 1895, with general remarks on the weather of each month.

Monthly Weather Review of the Nebraska Weather Service, 1894 (*Nebraska Sta. Bul. 37, pp. 96, figs. 52*).—Summaries for each month of 1894 of meteorological observations by the State Weather Service coöperating with the Weather Bureau of this Department, accompanied by outline maps of the State showing isotherms, direction of the wind, and precipitation, and charts recording velocity of wind, temperature, pressure, humidity, and precipitation, as shown by self-registering instruments at the station.

Meteorology for 1893, R. D. NEWTON (*New York State Sta. Rpt. 1893, pp. 718–733*).—This includes tables showing precipitation by months since 1882; wind record for 1893; sunshine records for 1893; a summary of sunshine records, May 1, 1885, to January 1, 1894, and daily readings of maximum, minimum, and standard air thermometers.

North Carolina weather during January and February, 1895, H. B. BATTLE, C. F. VON HERRMANN, and R. NUNN (*North Carolina Sta. Weather Service Bul. 64, pp. 1–16, maps 2; 65, pp. 19–32, maps 2*).—The usual records of observations.

WATER—SOILS.

Contributions to the study of the reclaimed marshes of the region of Médoc, France, F. BERTHAULT and J. CROCHETELLE (*Ann. Agron., 21 (1895), No. 3, pp. 122–134*).—This is an account of an investigation, including observations on crops and system of culture and physical and chemical analyses of soils of the reclaimed lands along the left bank of the Gironde estuary in the region of Médoc. These lands are protected on the west from the violent and salt sea winds by sand dunes which have been covered by forest growth and other vegetation, while the waters of the estuary are kept out by dikes and the soil is drained by numerous ditches and canals. Occasionally, however, the salt water breaks through the dikes, flooding the land and making it unfit for cultivation for several years.

In a study of the causes of the sterility thus produced the authors found that when soils which had thus been flooded contained 0.5 per cent of salt the growth of the ordinary field crops was seriously retarded, but that with 0.2 per cent cereals grew normally. It was further observed, however, that in soils of this region, termed saline and abandoned for that reason, sterility was sometimes due to a deficiency of phosphoric acid and to slow nitrification resulting from imperfect cultivation.

On the composition of drainage waters, P. P. DEHÉRAIN (*Compt. Rend., 120 (1895), No. 13, pp. 701–706*).—An account is given of observations in the same line as those reviewed in previous numbers of the Record.[1] Comparing the results obtained in 1893, which was a year of poor crops, with those obtained in 1894, a season of good crops, it was found that drainage water was more abundant and much richer in 1893 than in 1894. The poverty of the waters in 1894 is attributed to the vigor of the plants, which by means of their numerous roots completely assimilated the nitrates. The diminished amount of drainage was due to the vigorous leaf growth, which returned to the atmosphere all of the water supplied by precipitation except during wet periods. Abundant drainage was obtained only during the winter, while during the summer no water passed off in the drains.

It is calculated that the wheat crop of 1894 per hectare contained 91 kg. of nitrogen and in 1893 only 44.2 kg., but in 1893 the soil lost 49.7 kg. of nitric nitrogen in the drainage water, while in 1894 the loss from this source was insignificant. The total amount of nitrogen removed from the soil in the good season of 1894 was therefore 91 kg., as against 93.9 kg. in the bad season of 1893.

Further experiments by the author confirm previous conclusions that fallow soils lose much more nitrogen in the drainage than those covered with crops, and emphasize the importance of planting autumn catch crops.

The more important results obtained on 20 vegetation boxes left bare and bearing various crops (grapes, sugar beets, wheat, and oats) are given in the following table:

Losses of nitric nitrogen in drainage waters.

	Loss per hectare.	Ratio of drainage to rainfall.
	Kg.	
Bare soil:		
1893–'94	101.60	4.5
1894–'95	79.80	5.5
Soil bearing crops:		
1893	33.25	7.6
1894	.20	135.0

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[1] E. S. R., 6, pp. 353, 491.

Attention is especially called to the facts that the losses from covered soil were much greater in 1893 than in 1894, and that both the losses and the ratios of drainage to rainfall were higher than those reported by Schlössing (see below).

The loss of nitrogen in drainage water, T. SCHLÖSSING (*Compt. Rend., 120 (1895), No. 10, pp. 526–530*).—The author maintains that the studies on this subject, made for the most part in vegetation pots or boxes, for obvious reasons, have given results much in excess of the truth, and that examinations of the water of streams draining a given area will furnish a more accurate measure of the loss of nitrogen in drainage. Determinations of nitric nitrogen in the waters of the Seine, Marne, Yonne, and Oise are reported, and estimates based on the results are given which indicate that each hectare of soil in the Seine basin loses 4.2 kg. of nitric nitrogen if one sixth of the rainfall escapes in the drainage, 6.44 kg. if one fourth escapes, and 8.48 kg. if one third escapes. It is stated that while these results do not warrant definite conclusions they nevertheless indicate that the losses of nitrogen in the drainage water are not so important as has been supposed.

A chemical process of purifying water, F. BORDAS and C. GIRARD (*Compt. Rend., 120 (1895), No. 12, pp. 689–691*).—In this process slightly more permanganate of lime than is necessary to oxidize the organic matter is added to the water and the excess of permanganate reduced and the color destroyed by manganese dioxid.

Soil temperatures (*Nebraska Sta. Bul. 37, pp. 96, charts 12*).—Charts are given showing soil temperatures at the station at depths of from 1 to 36 in. during each month of 1894.

Soil temperatures, R. D. NEWTON (*New York State Sta. Rpt. 1893, pp. 734–739*).—Tridaily readings of soil thermometers at depths of 1 to 18 in. are recorded for 6 months (May to October) of 1893.

FERTILIZERS.

The influence of oxid of iron and alumina in the reversion of superphosphate, A. SMETHAM (*Jour. Soc. Chem. Ind., 14 (1895), No. 2, pp. 112–114; 3, pp. 242, 243*).—The chemical changes which take place in the reversion of the monophosphate of lime in superphosphates to dibasic phosphate are explained, and it is claimed that "where fine grinding is the rule, and where the mixing is complete, and the acid usually in excess of that required for the transforming of the tribasic phosphate to monobasic form, reversion due to the formation of a dibasic phosphate is seldom, if ever, met with." When, however, as is usually the case, the original phosphate contains an appreciable amount of oxid of iron or alumina it is found that the solubility of the phosphoric acid of the superphosphate diminishes to a considerable extent on keeping, any quantity over a very small percentage of oxid of iron and alumina being considered "as reverting double its weight of soluble phosphate."

In studying the relative effects of oxid of iron and alumina in causing reversion the author selected samples of known history and character and determined (1) the effect on the solubility of the phosphoric acid of adding known quantities of the oxid of iron or alumina, and (2) the solubility of the latter at different periods.

In a superphosphate containing 25.97 per cent of soluble phosphoric acid and 3.21 per cent of insoluble phosphoric acid the addition of an amount of sulphate of iron containing Fe_2O_3 equal to 1.36 per cent of the superphosphate resulted in the immediate reversion of 1.86 per cent of acid, 2.39 per cent in one year, and 2.42 per cent in 15 months. Aluminum sulphate was added to the same superphosphate in an amount furnishing Al_2O_3 equal to 1.1 per cent of the whole mixture, but the results were much less marked than in the case of the addition of iron. The immediate reversion was 0.17 per cent, at the end of a year 0.83 per cent, and at the end of 15 months 1.02 per cent. An examination of other samples of superphosphate showed that reversion was due principally to the oxid of iron present.

A superphosphate which showed when made 36.5 per cent of soluble phosphoric acid contained at the end of a year 38.19 per cent, and it is noted that in case of high percentage superphosphates there is frequently an increase rather than a decrease of soluble phosphoric acid on keeping.

"A review of the facts already obtained makes it pretty certain that there is a wide difference in the behavior of oxid of iron and alumina in the manufacture of superphosphate. The first, for practical purposes, seems to revert phosphate in what may be called theoretical proportions, viz, 160:310, or as nearly as possible 2 parts of phosphate to 1 of oxid of iron, while the alumina, which, if acting in the same manner as oxid of iron, would revert three times its weight of phosphate, at most seems to cause a retrogression of its own weight. It has long been known that superphosphate manufactured from Florida phosphate increases in the percentage of soluble phosphate instead of retrograding, and as this phosphate contains scarcely any oxid of iron, but 2 to 3 per cent of alumina, it was difficult to understand this behavior. The foregoing results, however, explain the matter.

"Under these circumstances, and especially as many of the phosphates now coming into the market contain alumina in larger proportions than oxid of iron, it appears to me that there is pressing need for a revision of the terms of the contracts on which phosphates are usually sold, and for a differentiation of oxid of iron and alumina in the analysis upon which the sales are made."

In the discussion following the reading of this paper its essential conclusions were confirmed by several other analysts.

Farmyard manure (*Agl. Jour. Cape Colony, 8 (1895), No. 5, p. 111*).—In trials of covered and uncovered manure on potatoes and wheat during 2 years the results strongly favored the covered manure.

Utilization of the refuse bones of the farm, L. GRANDEAU (*Jour. Agr. Prat., 59 (1895), No. 15, pp. 527, 528*).

Nitrate deposits in South Africa (*L'Engrais, 10 (1895), No. 15, p. 352*).—The discovery of nitrate deposits in caves near Prieska at an elevation of 3,000 to 4,000 ft. is noted. The material is composed generally of nitrate of lime, but sometimes contains 95 per cent of finely crystallized nitrate of potash. The nitrates are believed to be formed from the accumulated excrement of rabbits, which breed in numbers in that locality. An English company has been organized for the exploitation of the deposits.

What is Thomas slag and how shall it be used? M. MÄRCKER (*Ztschr. landw. Ver. Hessen, 1895, No. 12, pp. 90–92; Wochenschr. pom. ökon. Ges., 25 (1895), No. 7, pp. 79–81; Königsberger land- und forstw. Ztg., 1895, No. 11*).

Note on the decomposition of phosphates containing fluorin, S. FEITLER (*Dingler's polytech. Jour., 294, pp. 188, 189; abs. in Jour. Soc. Chem. Ind., 14 (1895), No. 3, p. 286*).

Commercial fertilizers (*Kentucky Sta. Bul. 52, pp. 83–116*).—Analyses and valuations of 11 official samples of fertilizers (sent to the station by manufacturers) and 87 samples sent by farmers or taken by deputy inspectors are tabulated and discussed.

Inspection and analyses of commercial fertilizers sold in Maryland, H. B. McDONNELL, ET AL. (*Maryland Sta. Bul. 30, pp. 3–54*).—Explanations of terms used in fertilizer analyses, notes on guaranties and valuation, a list of manufacturers licensed to sell fertilizers in Maryland in 1894, text of the State fertilizer law, and tabulated analyses and valuations of 362 samples of fertilizing materials.

Analyses and valuation of manurial substances (*Massachusetts State Sta. Bul. 57, pp. 6–8*).—A schedule of trade values for 1895 is given, together with tabulated analyses of 22 samples of fertilizing materials, including ashes, cotton-hull ashes, ground bone, cotton-seed meal, guano, sheep fertilizer, and peat.

Commercial fertilizers, P. COLLIER and L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 181–204, 497–539*).—Text of the State fertilizer law, notes on the agreement of actual and guaranteed composition, valuation, and home-mixing, and tabulated analyses of 330 samples of fertilizers, with a statement of the amounts of different kinds of fertilizers reported as sold in the State during the year ending November 1, 1893. The aggregate amount was 106,520 tons.

Fertilizer analyses, H. B. BATTLE (*North Carolina Sta. Spec. Bul. 24, pp. 14; 25, pp. 16*).—These bulletins give a digest of the State fertilizer laws, explanations of terms used in analysis, notes on valuation, freight rates, and tabulated analyses and valuations of 313 samples of fertilizers.

Analyses of commercial fertilizers, J. L. HILLS and B. O. WHITE (*Vermont Sta. Bul. 45, pp. 3–8*).—A schedule of trade values for 1895, notes on valuation, tabulated analyses of 15 samples of fertilizers, and a list of manufacturers paying license fees as required by law.

FIELD CROPS.

Field experiments with corn, 1894, F. D. GARDNER (*Illinois Sta. Bul. 37, pp. 24*).

Synopsis.—Accounts are given of experiments in the following lines: (1) Test of varieties, (2) time of planting, (3) thickness of planting, (4) continuous cropping *vs.* a rotation of crops, (5) cross fertilization, (6) detasseling, and (7) listing. The results of these and previous experiments at the station favor (1) the medium maturing white varieties, (2) planting in May, especially from the 11th to the 18th of the month, (3) thick planting, (4) rotation of crops, and (5) cross fertilization. The yield of detasseled corn in 1894 was 13 per cent greater than that not detasseled, although in 1891 and 1892 detasseling had exercised no marked effect on the yield.

The experiments in 1894 were in continuation of those reported in Bulletin 31 of the station (E. S. R., 6, p. 29). They were conducted on dark colored, fertile prairie soil in hills 3 ft. 8 in. apart each way.

Varieties (pp. 1–16).— The test of varieties occupied 84 fortieth-acre plats, and the results are given in detail in tables, summaries, and general notes. Mixtures of 2 and 4 varieties gave larger yields in 1894 than single varieties, though mixtures did not afford the larger yield every year. The height of stalks and size of ears increased with lateness of maturity. Of 13 varieties tested during 5 years Boone County White gave the largest yield, 71.5 bu. per acre, followed by Burr White, 61.9 bu., and Leaming, 60.7 bu. per acre. The medium maturing varieties averaged for 7 years 65.2 bu., the late varieties 58.8 bu., and the early varieties 55.5 bu.; the yellow varieties averaged for 7 years 60.3 bu. per acre, and the white varieties 63.2 bu.

Time of planting (pp. 16–18).—Burr White was planted at intervals of a week from April 6 to June 22; the average yield for 7 years was greater from planting from May 11 to May 18. The variation was slight for the dates between April 27 and May 25.

Thickness of planting (pp. 18, 19).—In 1894, 2, 3, 4, and 5 kernels were planted in hills 3 ft. 8 in. apart each way; the yield from planting 2 kernels was 40.2, 3 kernels 46, 4 kernels 49, and 5 kernels 48 bu. per acre. In another field with 3 kernels per hill the yield was 44.6, and with 4 kernels 50.5 bu. per acre.

Continuous corn cropping compared with rotation of crops (pp. 19, 20).—Corn grown in rotation with oats and clover yielded 40 per cent more than corn in continuous culture. Tabulated data give the yields in detail.

Cross fertilization (pp. 19, 20).—From cross fertilized plants seed was selected in 1892 and again in 1893, the latter, together with both parent varieties, being used for the crop of 1894. The average increase in yield in 1894 from the cross fertilized seed was 12 bu. per acre.

Detasseling (pp. 21–23).—The tassels were removed from stalks on alternate rows; on the detasseled rows the yield was 56.5 bu., and on those not detasseled 50 bu. per acre. The increase in yield was greater where the tassels were removed early than where they were removed later. Contradictory results secured in previous years and at other stations are briefly noted. "If an increase in grain is secured by detasseling, it is most likely to be on poor soil or in dry seasons. It seems that the injury done the plants sometimes reduces the yield."

Corn, W. W. COOKE and F. L. WATROUS (*Colorado Sta. Bul. 30, pp. 12–21, 24, 25*).—Eight varieties of flint corn and 14 of dent corn were tested. The average yield of dry matter per acre was with the small flint varieties 2.70 tons, with the large flint varieties 2.51 tons, with the small dent varieties 3.60 tons, and with the large dent varieties 3.38 tons. The largest yield of corn, 43 bu. per acre, was made by the small dent varieties Huron and White Pearl. The earliest variety was a small flint, Will 70-Day Gehu, which yielded 37.8 bu. of corn per acre, and which seems adapted to many portions of the State which are generally regarded as too cold for corn.

Red Cob corn cut September 29 afforded no more dry matter per acre than when cut September 5. "The figures seem to show that in this part of Colorado, so near the foothills, corn can not be depended on to grow after the first week in September, and such varieties should be chosen as will reach the glazing stage by that time."

Coöperative soil tests with corn, A. J. BONDURANT (*Alabama College Sta. Bul. 59, pp. 23*).—This is a report of coöperative tests in 23 localities. A fertilizer consisting of equal parts of cotton-seed meal and superphosphate, applied to corn at the rate of 1,000 lbs. per acre, resulted in a financial loss of $2.29 per acre. The author assumes that peas planted between the corn rows would have yielded in the same proportion as the corn, and on this basis calculates a profit of 71 cts. per acre in favor of fertilizers.

The loss of corn fodder in drying, W. W. COOKE and F. L. WATROUS (*Colorado Sta. Bul. 30, pp. 23, 24*).—In 1893 the loss of dry matter in field curing corn was fully one third. In 1894 corn was cured in shocks, each containing about 500 lbs. of green fodder, in small shocks, and in a thin layer on the ground.

"So far as could be told by the eye there had been no loss. The fodder had cured in nice shape, and the stalks on the inside of the bundles retained their green color, with no sign of molding or heating. And yet the large shocks had lost 31 per cent of their dry matter, or feeding value, the small shocks 43 per cent, and the corn spread on the ground 55 per cent.

"On breaking or cutting the stalks these losses were explained. The juice was acid, and there was a very strong acid odor, showing that an active fermentation was taking place in this seemingly dry fodder."

Flax for seed and fiber, C. R. DODGE (*U. S. Dept. Agr., Farmers' Bul. 27, pp. 16*).—The author shows that good seed and salable fiber can be produced from the same plant. He points out the need of scutch mills, and advises a threefold division of labor in establishing an American flax fiber industry, viz, the growing of the crop by the farmer, the retting and scutching by the purchaser or factor, and the spinning and weaving by the manufacturer.

Other topics treated are soil selection and preparation, fertilizing, rotation, kind and amount of seed, meteorological considerations, and harvesting seed and fiber.

Experiments with foreign seeds, P. H. MELL (*Alabama College Sta. Bul. 60, pp. 27-32*).—Analyses are given of *Eleusine corocana* and *Paspalum scorbiculatum*, two foreign plants which proved satisfactory for forage. Japanese buckwheat, flat pea, and soja beans succeeded on the station farm. Sugar beets, damaged by nematodes, contained 8.5 to 11.4 per cent of sugar. Chick-pea, sesame, and green gram (*Phaseolus mungo*) were grown, and the last-named plant matured earlier than the garden pea.

A contribution to the study of hops, A. LEPLAE (*Contribution a l'étude du houblon. Bruxelles: 1895, pp. 84, figs. 72*).—This publication is chiefly devoted to the methods of drying hops and to the construction of hop kilns. Chemical and mechanical analyses of dried-hops, qualities desired in hops, and methods of harvesting also receive attention.

Although the cones bearing seeds do not contain less lupulin than the unfertilized flowers, they are not favorably regarded by brewers in

Belgium. However, the entire destruction of the male plants so as to prevent fructification not only diminishes the yield, but delays the development of the cones.

The author favors curing by means of flue heat rather than with open fires, because the former conserves the natural aroma, reduces the danger from fire, and permits the easy regulation of temperature and draft. He states that the initial temperature of drying should not exceed 95° F., and that the temperature should never rise above 104° F. A temperature too high causes the loss of essential oil, imparts a distinct and undesirable odor, and injures the appearance of the product.

He regards sulphuring as indispensable, as it destroys fungi and thus permits the easier conservation of hops, without, as he states, endangering the health of consumers of beer. Kaemmerer had shown that hops took up about 0.48 per cent of their weight of sulphurous acid, of which, however, only one fourth or one fifth was retained permanently, the remainder being dissipated in about 4 weeks.

The author regards 1 to 1½ lbs. of sulphur as sufficient for 100 lbs. of hops, if the sulphur is burned early in the process of drying.

Oats, A. C. MAGRUDER (*Oklahoma Sta. Bul. 16, pp. 33–40*).—With the Jensen hot-water treatment for smut the yield was increased 1.41 bu. per acre. When the seed bed was rolled twice the yield was slightly reduced. Broadcasting afforded a smaller yield than did the press drill. Subsoiling reduced the yield on alkali land. Fifty varieties, of which the seed was grown in Oklahoma or farther south, averaged 13.8 bu. per acre; 34 varieties from the States farther north 12.4 bu. The variety Lincoln is recommended. Deep fall plowing gave a larger yield than deep spring plowing or shallow fall plowing. Other subjects briefly mentioned are amount of mixture between varieties, quantity of seed, and continuous culture of oats without manure.

Varieties of potatoes, F. W. RANE (*West Virginia Sta. Bul. 38, pp. 32–38, 46–50, figs. 3*).—Of 36 varieties tested on single or duplicate rows 75 ft. long, the following are recommended: American Wonder, Rural New Yorker No. 2, Great Divide, Superior, Crown Jewel, Early Everitt, and Maggie Murphy.

Potato experiments, R. H. MILLER and E. H. BRINKLEY (*Maryland Sta. Bul. 31, pp. 73–82*).—The experiments consisted of tests of varieties, green manuring, spraying, distance, methods of cultivation, and amount of seed. When crimson clover was plowed under as a green manure early in May the yield increased by more than 19 bu. per acre. Spraying with Bordeaux mixture afforded a larger yield than the untreated plat, and when spraying was begun early the yield was further increased. Distances of 14½ by 30 in. afforded a larger yield than distances of 12 by 36 in. Deep cultivation, ridge culture, and cultivation continued late in the season proved slightly advantageous. Small whole seed potatoes afforded a larger profit than large whole potatoes and cuttings.

Determination of sugar in beets, cornstalks, and sorghum, P. COLLIER (*New York State Sta. Rpt. 1893, pp. 176–178*).—The percentages of sugar in 8 varieties of beets, in the stalks of 3 varieties of sweet corn, and in sorghum are given. The juice of the cornstalks averaged 11.4 per cent of total sugar, "or nearly 92 per cent of that present in the sugar cane juice." The weight of topped and stripped stalks of sweet corn growing on an acre is estimated at 9,257 lbs., but the quantity of juice is not reported.

The composition of wheat grown on saline soil, BERTHAULT and CROCHETELLE (*Compt. Rend., 120 (1895), No. 12, pp. 691–693*).—In Algeria it frequently occurs that hot weather early in June causes vigorous wheat plants on certain kinds of soil to lose their green color, the heads drying and the grain becoming shriveled and hard. The crop is largely reduced. This trouble occurs on saline soil. A sample of such soil contained 0.64 per cent of potash, 0.26 per cent of soda, and 0.014 per cent of chlorin. The nodes and the middle internodes of wheat plants affected as above were covered with a deposit of chlorid of potash. Chlorid of potash was found to be most abundant in the nodes, the dry matter of which contained 0.718 per cent of this salt, while the dry matter of the entire plant contained 0.125 per cent.

Farm notes for 1894, W. W. COOKE and F. L. WATROUS (*Colorado Sta. Bul. 30, pp. 3–12*).—Six varieties of wheat, 15 of oats, 8 of barley, 4 of buckwheat, 6 of millet, and 5 of beets were tested. Polish wheat, also incorrectly known as Mammoth Spring rye, yielded under unfavorable conditions 25 bu. of grain per acre. It is recommended as a stock food, but needs first to be ground. Of the varieties of barley tested the California is recommended, on account of its productiveness and drought-resisting qualities. The effects of tankage and bone meal were tested on potatoes, with inconclusive results.

Yellow millo maize, white millo maize, evergreen broom corn, Japan broom corn, African millet, Jerusalem corn, Egyptian corn, red Kaffir corn, and white Kaffir corn were grown; yellow millo maize ripened earliest and afforded the largest yield of forage and of grain.

Flat pea (*Lathyrus sylvestris*) and sachaline (*Polygonum sachalinense*) showed no very desirable qualities. Rape yielded very heavily, the smallest yield on any plat being 22 tons of forage per acre.

Alfalfa, its characteristics, cultivation, worth, uses, and adaptability to Kansas (*Rpt. Kansas Bd. Agr. 1895, Mar. 31, pp. 3–43*).—This is an abridgment of a previous report on alfalfa culture in the West.

Jerusalem artichoke (*Agl. Jour. Cape Colony, 8 (1895), No. 5, pp. 109, 110*).—Notes on the culture, yield, and value.

Sprouting beet seed before sowing (*Landw. Centbl. Posen, 33 (1895), No. 13, p. 74*).

Cañaigre, A. E. BLOUNT (*New Mexico Sta. Bul. 14, pp. 37–44*).—This is a general discussion of the subject, the topics treated being description of the plant, habits of growth, yield, relative value as a tannin plant, and methods of cultivation. On irrigated land on the station farm the yield was estimated at 4 to 10 tons of green cañaigre per acre. Cañaigre seed germinated satisfactorily.

Canary seed (*Abs. in Agl. Jour. Cape Colony, 8 (1895), No. 5, pp. 108, 109*).—The article gives directions for the cultivation and harvesting of *Phalaris canariensis* grown for the seed.

Analyses of varieties of corn, V. Vedrödi (*Chem. Ztg., 19 (1895), No. 17, p. 350*).—Analyses of American and Hungarian varieties of corn.

American cotton in Turkestan, C. Jonas (*U. S. Consular Rpt. 1895, Jan., pp. 123–125*).

Flax cultivation in Ireland, J. B. Taney (*U. S. Consular Rpt. 1895, Jan., pp. 51–57*).—This report is largely statistical.

Fertilizer experiments on flax in 1894 (*Mitt. deut. landw. Ges., 1895, No. 3, pp. 21, 22*).

What is common millet? A. A. Crozier (*Agl. Sci., 8 (1894), No. 10–11, pp. 449, 450*).

Experiments with varieties of potatoes, J. Dufour and F. Péneveyre (*Chron. Agr. Cant. Vaud, 8 (1895), No. 7, pp. 163–168*).

Mulching potatoes, F. A. Waugh (*Oklahoma Sta. Bul. 15, p. 32*).—Mulching soon after the plants came up largely increased the total yield and afforded larger potatoes and a higher percentage of merchantable potatoes.

Mangel-wurzels, carrots, turnips, ruta-bagas, and sugar beets, C. F. Curtiss (*Iowa Sta. Bul. 27, pp. 114–119*).—As a root crop for most classes of stock the flat turnip is preferred; but carrots are best suited for horses. General notes on varieties and culture of roots and analyses of sugar beets grown in 1894 are given.

Turnips, cabbage, sweet corn, and potatoes, J. Wilson (*Iowa Sta. Bul. 27, pp. 105–108*).—This article consists of notes on these crops during the dry season of 1893. A yield of turnips at the rate of 24 tons per acre was attributed by the author to the frequent and careful cultivation of the surface soil.

Nebraska and the beet-sugar industry, M. Hollrung (*Nebraska Sta. Bul. 38, pp. 97–126*).—This publication is a translation by H. H. Nicholson of a report made on the above subject and published in the *Zeitschrift des Vereins für die Rübenzucker Industrie des Deutschen Reichs*. Special attention is devoted to the conditions of soil, climate, and labor in Nebraska, and the comparative expense of growing an acre of sugar beets in Nebraska and Germany.

Fertilizer experiments on tobacco, Barth (*Mitt. deut landw. Ges., 1895, No. 2, pp. 13–15*).—The effect of potash on burning quality of tobacco is especially noted.

American tobacco for Italy (*U. S. Consular Rpt. 1895, Mar., pp. 422–425*).

Greek tobacco, its composition and statistics of culture, A. K. Dambergis (*Internat. Kong. angew. Chem. Brüssel; abs. in Chem. Centbl., 1895, I, No. 9, p. 491*).

Subsoiling, S. Kelsey (*Rpt. Kansas Bd. Agr. 1895, Mar. 31, pp. 203–206*).—A record of a favorable experience in Kansas.

The press drill vs. the common grain drill, C. F. Curtiss (*Iowa Sta. Bul. 27, pp. 113, 114*).—Winter wheat sown in October with the press drill yielded more than the same variety planted with the common grain drill. The variety of winter wheat recommended is the Turkish Red.

HORTICULTURE.

Influence of climate on onions from seed, J. Troop (*Indiana Sta. Bul. 53, pp. 118, 119, figs. 2*).—Experiments with 3 plats of onions grown from native and foreign seeds to determine their comparative value. The land used was the surface of an old marsh cleared and cropped a year previous. There were sown seeds of the Prizetaker variety, grown in Italy, and also seed grown in Minnesota. French-grown seed of Giant Rocca was sown as a test to show that any difference in yields in the 2 plats of Prizetaker was not due to soil differences.

The seed was sown in 14 in. drills, April 7, and on September 7 the Italian onions were ripe, while the plants from the Minnesota seed were still green and showing very few bulbs. Later in the season some of the Minnesota onions formed small, soft bulbs of little market value. The estimated yield per acre was as follows: Italian Prizetaker 500 bu., Minnesota Prizetaker 33 bu., French Giant Rocca 518 bu. Some of the Minnesota seed was sown also in that State, where it produced a large crop of fine onions.

The experiment is considered as indicating that failure in onion crops is as frequently due to improper climatic conditions as to poor seed.

Sweet potatoes, culture and uses, J. F. DUGGAR (*U. S. Dept. Agr., Farmers' Bul. 26, pp. 30, figs. 4*).—A popular bulletin containing information upon the propagation, soil, transplanting, cultivation, manuring, harvesting and storing, varieties, fungus diseases, insect enemies, uses, and cost of production of sweet potatoes. Propagation by means of sets is advised, although in some cases larger yields have been produced from cuttings. The preferred method of constructing a plant bed is detailed, the potatoes being placed on a thin layer of sand over a thick basis of fresh, moistened barnyard manure, and covered with wood earth. An illustration is given of an artificially heated propagating bed. Sound, well-formed potatoes of small to medium size are recommended, from 2 to 4 bu. furnishing sufficient sets to plant an acre, about 3 " drawings " being made.

A light, well-drained soil is advised, the sets being transplanted on low ridges by hand or mechanical devices when danger from frost is over and the sprouts are from 3 to 5 in. above the ground. Placing the plants 18 in. to 2 ft. apart in 3½ to 4 ft. rows seems to give the best results. Shallow, clean cultivation, discontinued the latter part of the season, is recommended, and moving the vines after the last cultivation is not considered necessary.

Analyses of sweet potato roots and vines, showing the fertilizing ingredients removed by them from the soil, are given, as also formulas for fertilizers to replace the loss. A fair yield per acre is stated to be 185 bu. (10,000 lbs.), extracting from the ground 23 lbs. of nitrogen, 10 lbs. of phosphoric acid, and 50 lbs. of potash, which can be restored to the soil by 150 lbs. of nitrate of soda, 90 lbs. of acid phosphate, and 370 lbs. of kainit.

It is advised that sweet potatoes be kept at a temperature of 75° F. for a week or two after digging, and throughout the winter the temperature be maintained at 50 to 60° F. The storage room or cellar should be dry, to avoid the induction of decay by moisture condensing on the roots.

As varieties for consumption in the Southern States are recommended Sugar Yam, Yellow Yam, and Barbadoes; in the Northern States, Big Stem Jersey and Nansemond; as food for live stock, Providence, Shanghai, Hayman, Red Bermuda, and Southern Queen, these being the most productive.

The diseases treated of are the black rot (*Ceratocystis fimbriata*), soil rot (*Acrocystis batatas*), soft rot (*Rhizopus nigricans*), dry rot (*Phoma batatæ*), white rot, sweet-potato scurf (*Monilochætes infuscans*), stem rot, leaf blight (*Phyllosticta bataticola*), and white leaf scab (*Albugo ipomϾ-panduranæ*). Destroying infected roots and giving a rotation of crops is advised in general, and for the soft rot dusting the stored potatoes with fostite. Brief mention is made of cutworms, flea beetles, tortoise beetles, sweet-potato sawflies, the sweet-potato root beetle (*Cylas formicarius*), and sweet-potato hawk moth. Spraying with Paris green is recommended for all but the root beetle, for which pulling up and burning all affected roots and vines is given as the only remedy.

Drying and canning sweet potatoes are discussed, as also the value of the crop as a food for stock, for which purpose its more extensive use is urged. The average composition of several varieties of sweet potatoes is tabulated, and the relative food value of sweet potatoes and corn compared, by which it is seen that 3 lbs. of sweet potatoes contain nearly as much dry matter and quite as much carbonaceous material as 1 lb. of corn, but less than half as much protein. The cost of growing and harvesting an acre of sweet potatoes, exclusive of rent and fertilizers, is estimated to average about $20.

A summary is appended, embodying the main points of the bulletin.

Sweet potatoes, H. N. STARNES (*Georgia Sta. Bul. 25, pp. 127–161*).—In the abstract of this bulletin in a recent number of the Record (6, No. 9, p. 811) an error occurs in the first line of the quoted passage at the top of page 812 which reverses the author's conclusions. The sentence should read "The split-leaf varieties are among the most unproductive." In the preceding sentence of the abstract the word "Clay," used as a synonym for the variety Shanghai, should be "California."

Notes on tomatoes, M. J. HUFFINGTON (*Colorado Sta. Bul. 30, pp. 26–32*).—Descriptive notes and tabulated data on a comparative test of 39 varieties grown at the station in 1894. The plants were started in a forcing house and handled once before planting in the open ground. They were irrigated 4 times during the growing season. As a rule the newer varieties did not prove equal to the older standard kinds. Maule Earliest of All, Vaughan Earliest of All, Atlantic Prize, Perfection, Rosebud, and Ignotum produced the largest yields. For canning are recommended Beauty, Perfection, Long Keeper, Puritan, Ignotum, and Royal Red.

Report of the horticulturist, S. A. BEACH (*New York State Sta. Rpt. 1893, pp. 543–685, pls. 4, fig. 1*).—This report begins with brief remarks on the horticultural work accomplished by the station during the year in testing varieties, originating new fruits, giving addresses before farmers' clubs and institutes throughout the State, and displaying exhibits at the World's Fair at Chicago and at the State and local fairs.

Vegetables grown for exhibition (pp. 545–598).—A reprint of Bulletin 69 of the station (E. S. R., 6, p. 53).

Variety tests of apples (pp. 599–616).—Descriptive notes on 13 varieties of apples, chiefly of Russian origin, with a table showing the yield of 83 varieties of apples and 14 of crab apples. In addition are given lists of 126 varieties of pears, 7 of quinces, 143 of plums, 86 of peaches, 38 of cherries, 37 of currants, and 212 of gooseberries growing at the station.

Variety tests of grapes (pp. 617–626).—Comparative notes on 42 varieties, the species from which each is believed to have been derived being designated. A list of 210 varieties growing in the station vineyard is appended.

Variety tests of blackberries, dewberries, and raspberries (pp. 626–655).—A reprint of Bulletin 63 of the station (E. S. R., 5, p. 786).

Some experiences in testing strawberries (pp. 656–676).—A reprint from Bulletin 64 of the station (E. S. R., 5, p. 874), with in addition a list of 128 varieties fruiting at the station in 1893, and descriptive and comparative notes on 34 of them.

Strawberry crosses (pp. 677–685).—A reprint from Bulletin 64 of the station (E. S. R., 5, p. 874).

Garden vegetables, F. A. WAUGH (*Oklahoma Sta. Bul. 15, pp. 17–29, figs. 7*).—Comparative notes and tabulated data on 15 varieties of peas, 26 of muskmelons, 25 of watermelons, 34 of cucumbers, 30 of lettuce, 11 of potatoes, 14 of tomatoes, 10 of onions, 4 of okra and salsify. The following varieties are recommended: *Muskmelons*—Early Nutmeg, Jenny Lind, and Banquet; *lettuce*—Denver Market, Hanson, and Henderson New York; *tomatoes*—Dwarf Champion, Dwarf Aristocrat, Perfection, Matchless, Optimus, and Ignotum; *onions*—Prizetaker; *okra*—White Velvet and Dwarf.

The recent apple failures of western New York, L. H. BAILEY (*New York Cornell Sta. Bul. 84, pp. 34, pls. 4, figs. 6*).

Synopsis.—A discussion of the causes of the small apple crops in late years, with letters from a number of prominent orchardists in regard to experience with spraying trees. For the production of large crops is advised liberal tilling, efficient fertilizing, careful pruning, and judicious spraying.

It is stated that one of the most important reasons for the failure of the apple crop is the usual custom of allowing the orchards to run to sod or else growing cereals among the trees. In this way the soil is impoverished and the fruit trees can make but a scanty growth. It is urged that orchards be well drained and frequently and lightly cultivated during the late spring and early summer, followed by the sparing use of nitrogenous fertilizers. The tillage will serve as a conservator of moisture, and in this way prevent great damage by drought. In orchards which have been long in sod the turf should be broken up in the spring while soft by means of a sharp-toothed harrow, and afterwards plowed shallow. As fertilizers, potash and phosphoric acid are recommended, supplemented by nitrogen furnished by green manure crops, especially crimson clover.

The apple scab fungus, however, is believed to be the most prominent factor in crop failures, and its life history and damage are treated of at length and illustrated by a colored plate. Against the scab spraying with Bordeaux mixture is strongly advised, and results of experiments are given showing the benefit to be derived from this method. From 2 to 4 applications of the fungicide, beginning when the blossoms fall, and preferably applied during rainy weather, when the fungus spreads most seriously, are recommended.

It is believed that injurious insects can generally be held in check by means of spraying with Paris green, which can be advantageously combined with Bordeaux mixture. Letters are published from 5 prominent apple growers in the State who have experimented with spraying their trees with Bordeaux mixture, and who unite in urging the importance of early and thorough spraying. The illustrations are of imperfect or diseased fruit and branches and sprayed and unsprayed orchards.

Russian apples in Indiana, J. TROOP (*Indiana Sta. Bul. 53, pp. 123–125*).—Descriptive and comparative notes on 16 Russian varieties fruiting in the station orchard in 1894. The apples are considered as best suited for cooking purposes, although some of them make fair dessert fruit. The trees were hardy, thrifty, and healthy. None of the varieties have so far proved to be winter apples, all of them ripening in the summer and fall. It is believed that in colder climates, such as the northern parts of the United States, the varieties will do even better.

Grapes, F. A. WAUGH (*Oklahoma Sta. Bul. 14, pp. 14, pl. 1, figs. 6*).—This bulletin contains remarks on the location and exposure of the station vineyard, with an account of the methods of planting, pruning, and training employed. The Munson system of pruning and training is adopted, and is liked on account of the height at which the vines are trained, thus avoiding injury to the ripening grapes by reflected heat from the ground. The horizontal training of the shoots also offers less surface to the wind. The vineyard has not been troubled by injurious insects or diseases, with the exception of a temporary attack by the spotted grape beetle (*Pelidnota punctata*), that yielded promptly to spraying with arsenate of lead. Some of the bunches were bagged, which proceeding it is thought improved their appearance and kept them in better condition after ripening.

About 200 species and varieties are grown in the vineyard, of which 85 were in bearing last year. Brief descriptive and comparative notes are given for 33 black, 22 white, and 16 red varieties, showing also the weight and yield per vine. The following varieties are recommended for planting: *Black*—Janesville, Hartford Prolific, Champion, and Early Victor for early varieties; Herbert, Worden, Wilder, Concord, and Barry for general crop; *white*—Faith, F. B. Hayes, and Moore Diamond; *red*—Perkins, Brilliant, Goethe, and Catawba; *wine grapes*—Herbemont, Herman Jaeger, Cunningham, Elvira, Jaquez, and Catawba.

Some obstacles to successful fruit growing, F. W. CARD (*Nebraska Sta. Bul. 39, pp. 127–139, pl. 1*).

Synopsis.—The chief obstacles in the way of orchards in Nebraska are stated to be borers, mice and rabbits, crown galls, nematode galls, and drought. The results of experiments made to obviate these evils are given and remedies suggested.

The flat-headed borer (*Chrysobothris femorata*) is believed to do more damage than any other of the several species attacking fruit trees in the State, being far more injurious than the round-headed borer causing damage in the East. The life history is briefly noted. Experiments were made by applying various substances to the trunks of trees in early summer to prevent the beetles from laying their eggs. They were as follows: Soapsuds containing a little kerosene; carbolic acid and potash wash; potash, lard, and lime wash; white-lead paint; and copperas and lime whitewash. The best result was obtained by means of the white lead paint, although the washes containing potash are also recommended. The mixtures may be applied by means of an old broom, and one application will last 3 or 4 months.

In the case of damage by gnawing by mice and rabbits a thin coating of grafting wax over the injured portion was found to be more satisfactory than the mixture of soil and cow manure usually applied. Keeping the orchards clean from weeds and rubbish is recommended and rubbing the trunks of the trees with bloody meat or other disagreeable substances in the fall.

Crown galls, producing a rough, knotty growth on the trunks at the surface of the ground, are discussed and illustrated from photographs, but no remedy except that of destroying affected trees is suggested. Nematode root galls, which are sometimes found on trees received from the Southern States, it is believed will not cause much trouble in Nebraska on account of the cold winters killing the worms.

The greatest loss to fruit growers is believed to be due to lack of rain, and the question of preventing damage from drought by means of furnishing sufficient moisture to the soil is discussed. It is believed that frequent shallow cultivation will cause a greater conservation of moisture in the soil than can be supplied by irrigation. The opinions of prominent orchardists in the State are quite in support of this view. The planting of wind-breaks by the side of orchards is urged to prevent evaporation by winds. To test the value of different methods of cultivation the station orchard was divided up into plats, one of which was pastured, another mowed, a third harrowed every 2 weeks until the first part of August, while on the fourth shallow cultivation was continued until the beginning of October. The foliage made a much more thrifty growth in the cultivated plats, and the yield of fruit was 17 per cent greater than that from the mowed portion and 14 per cent greater than from that pastured. The moisture content of the soil for the first 20 in. was 20.4 per cent in that part of the orchard cultivated the entire season, against only 14 per cent in the mowed portion. As a result of the experiments frequent shallow cultivation to provide a mulch layer of loose, mellow soil is urged.

Protecting fruit from birds, J. TROOP (*Indiana Sta. Bul. 53, pp. 125, 126, pl. 1*).—In order to protect cherries from destruction by birds during the period of ripening, several trees of Russian varieties were covered with bird netting when the fruit began to ripen. The experiment was found to be successful, completely protecting the fruit, while other trees left open and uncovered were entirely stripped of their fruit. Two 6-year-old trees of Bessarabian cherries bore one half bushel each of fine fruit, while an unprotected tree of the same variety and age lost every cherry upon it. The advisability of thus protecting ripening cherries is believed to be thoroughly established. The expense of netting is small, 4 cts. per square yard, and soon balanced by the increased crops obtained. About 75 sq. yd. of netting were used on trees 10 ft. high.

Relation of blossoms to fruit, J. L. BUDD (*Trans. Iowa Hort. Soc. 1893, pp. 444–447*).—This paper states that flowers possessing slight staminate development produce better fruit than those more perfect. Recently top-worked apple trees produce earlier and hardier blossoms than do other trees, owing to the fact that the constriction at the point of union between graft and stock assists in the greater storage of starch in the twigs, thus furnishing more nutrition. Ringing trees also increases the productiveness and quality of the fruit, and enables the blossoms to withstand a lower temperature, for a similar reason. Drift soils on lower levels were found not to nourish the blossoming branches sufficiently to produce as satisfactory crops as were grown on higher bluff and loess soils. Manuring and irrigating unfruitful trees was found to induce a fair crop of fruit. Culture during the early summer and shading the soil during the hot months by a growth of buckwheat or a mulch of straw or coarse manure improved the general condition of the trees and increased the crops. Varieties produced by crossing native apples on Russian varieties were found to have the hardiness of the Russian parent, as well as quality of fruit approaching that of the native parent.

Best ferns for the North and Northwest, G. W. CARVER (*Iowa Sta. Bul. 27, pp. 150–153*).—This comprises some notes on various ornamental ferns for decorative purposes, several species of maidenhair ferns (*Adiantum* spp.), *Pteris*, *Onychium japonicum*, words ferns (*Nephrolepis*), *Cheilanthes tomentosa*, and *Selaginella* being recommended. Directions are given for propagating and growing ferns, the principal methods of propagation being given as dividing large plants, growing from buds, and growing from spores. Planting the ferns in a mixture of leaf mold, sand, and peat is advised, the pots being frequently watered and liquid manure occasionally applied, a repotting with fresh earth being given from time to time.

What is a cantaloupe? F. A. WAUGH (*Garden and Forest, 8 (1895), No. 376, pp. 183, 184*).—A discussion of the vagueness of the name, which in the South is applied to small, globular, netted, green-fleshed muskmelons, and in the North to larger, ovoid, smoother, yellow-fleshed fruit. The writer believes that the term should be limited to hard, rough-skinned, deeply grooved melons.

Some results obtained in crossing cucurbits, L. H. PAMMEL (*Trans. Iowa Hort. Soc. 1893, pp. 320–322*).—Brief notes on experiments in crossing plants of this kind, different species being found not to hybridize. No immediate results were found to follow crossing.

About mushrooms, the study of esculent and poisonous species, J. A. PALMER, Jr. (*Boston: Lee & Shepard, pp. 100*).

Top grafting the apple, C. G. PATTON (*Trans. Iowa Hort. Soc. 1893, pp. 203–210*).—A report on the answers to a circular letter on the subject sent out to numerous fruit growers in Iowa and adjoining States in regard to the influence of stock and scion. It is stated that the seedlings of a species make the best stocks for the different varieties of that species. The Transcendent crab is recommended for some varieties, especially Russian. It is advised that top grafting be done low when the stock is from 3 to 7 years old.

Dried apples in Germany, W. H. ROBERTSON (*U. S. Consular Rpt. 1895, Jan., pp. 89–92*).—A brief mention of official measures being taken in Germany to prevent the sale of American dried apples on the ground of their containing zinc. The writer urges that American producers of dried apples use wooden trays for drying, thus avoiding any objections on the point of zinc adulteration. It is believed, however, that the unwholesomeness of the fruit has been exaggerated.

New seedling plums, H. A. TERRY (*Trans. Iowa Hort. Soc. 1893, pp. 275, 276*).—Descriptive notes on 19 varieties, chiefly originating in Iowa.

Stone fruits in 1893, J. L. BUDD (*Trans. Iowa Hort. Soc. 1893, pp. 136–141*).—Some notes on experiments in propagating plums and cherries, with remarks on some other stone fruits. The sand cherry is recommended as a promising stock.

Top grafting, N. E. HANSEN (*Trans. Iowa Hort. Soc. 1893, pp. 362–364, fig. 1*).—Some popular directions on the subject.

New varieties of small fruit, R. D. MCGEEHON (*Trans. Iowa Hort. Soc. 1893, pp. 43–45*).—Brief descriptive notes on 11 recent varieties of strawberries, 5 of raspberries, and 1 of blackberries.

Strawberry culture, R. D. MCGEEHON (*Trans. Iowa Hort. Soc. 1893, pp. 456–459*).—Notes on successful methods, the details of cultivation being given.

Small fruits, C. ROOT (*Trans. Iowa Hort. Soc. 1893, pp. 68–72*).—A brief article on the cultivation, manuring, varieties, winter protection, and spraying of small fruits, particularly strawberries.

The Munson grape trellis, F. A. WAUGH (*Garden and Forest, 8 (1895), p. 186*).

Fruit culture, W. A. LUCE (*Maine Bd. Agr. Rpt. 1893–'94, pp. 188–191*).—A general popular paper on the culture of small fruits, strawberries being mentioned in particular.

Varieties and localities, C. L. WATROUS (*Trans. Iowa Hort. Soc. 1893, pp. 311–316*).—A popular discussion of the variation in the same variety when grown in different climates and latitudes.

The blossoms of the orchard fruits, N. E. HANSEN (*Trans. Iowa Hort. Soc. 1893, pp. 154–157*).—Notes on investigations to determine the reasons for the nonfertility of fruit blossoms. Plums, pears, and apples were experimented with, and numerous varieties were found to be self-sterile owing to peculiar development of the sexual elements.

Definite annual growth and its relations to hardiness, L. H. PAMMEL (*Trans. Iowa Hort. Soc. 1893, pp. 104–113, pl. 1*).—A discussion of the subject from the standpoint of morphological botany, with notes on a number of varieties of apple trees.

The improvement of our native fruits, B. A. MATTHEWS (*Trans. Iowa Hort. Soc. 1893, pp. 102, 103*).—Brief notes on some improved Iowa wild fruits, chiefly plums, crab apples, mulberries, juneberries, and gooseberries.

The relation of soil and climate to Iowa horticulture, D. A. KENT (*Trans. Iowa Hort. Soc. 1893, pp. 73–76*).—A popular paper giving an analysis of a sample of Iowa black loam and stating that the fertility of the prairie is due to the fact that the soluble elements in the soil are protected by freezing during the period of the greatest precipitation, when they might otherwise be dissolved and carried off by the rains.

Horticulture from a climatic standpoint, J. R. SAGE (*Trans. Iowa Hort. Soc. 1893, pp. 143–147*).—The author urges the careful study of the yearly temperature in determining the varieties to be grown, and the importance of furnishing the proper supply of moisture.

Horticultural lessons from the Columbian Exposition (*Trans. Iowa Hort. Soc. 1893, pp. 96–102*).—General article on the subject, with special reference to the Iowa fruit display.

The farmer's fruit and vegetable garden, W. S. FULTZ (*Trans. Iowa Hort. Soc. 1893, pp. 177–180*).—A general paper giving popular instructions and recommendations.

Fruit farming in Luxemburg, G. H. MURPHY (*U. S. Consular Rpt. 1895, Jan., pp. 75–80*).

The commercial preservation of fruits, J. L. BUDD (*Trans. Iowa Hort. Soc. 1893, pp. 270–272*).—A discussion of the methods of preserving fruit by means of cold storage, drying, and canning.

Exhibit of fruits and vegetables at the World's Fair, P. COLLIER (*New York State Sta. Rpt. 1893, pp. 173–176*).—A brief mention of the display sent by the station to Chicago, comprising 40 varieties of strawberries, 25 of currants, 167 of gooseberries, several of stone fruits, 17 of pears, 97 of apples, 154 of grapes, 433 of various vegetables, and specimens of sprayed and unsprayed branches and fruit. A list is given of the awards granted the station exhibits by the World's Fair Commissioners, and the exhibit made by the station at the State fair is summarized.

Laws of floral colors, E. M. BUDD (*Trans. Iowa Hort. Soc. 1893, pp. 53–56, fig. 1*).—A technical discussion of the subject, explaining the presence of special colors on chemical and physical grounds.

Hollies and their culture, J. MEHAN (*Cult. and Country Gent., 1895, Apr. 18, p. 308*).

Rose hybrids, J. L. BUDD (*Trans. Iowa Hort. Soc. 1893, pp. 359–361*).—Some brief notes on crossing roses, the hybrid seedlings being more vigorous than pure seedlings and blooming earlier.

Grafting the cacti, G. W. CARVER (*Trans. Iowa Hort. Soc. 1893, pp. 257–259*).—Notes on experiments in this line, cleft grafting and tongue grafting being most successful.

FORESTRY.

Conifers in the West, C. A. KEFFER (*Garden and Forest, 8 (1895), p. 182*).—Notes on red cedar, European larch, *Pinus resinosa*, arbor vitæ, spruces, and fir trees.

Rocky Mountain conifers, M. E. HINKLEY (*Trans. Iowa Hort. Soc. 1893, pp. 94, 95*).—A brief article treating of the manner in which some of the western evergreen trees were brought into public notice.

Four native trees in the Northwest, L. C. CORBETT (*Garden and Forest, 8 (1895), p. 173*).—Notes are given on the cottonwood, box elder, green ash, and white elm.

The European larch as a timber tree, N. A. REEVES (*Trans. Iowa Hort. Soc. 1893, pp. 176, 177*).—A brief note on a large planting of larches made some 20 years before, the trees being favorably regarded for their rapid growth, beauty, and timber value.

Evergreens for shelter belts, C. F. GARDNER (*Trans. Iowa Hort. Soc. 1893, pp. 90–92*).—The author advises the planting of evergreen trees as protection against winds, Norway spruces being especially recommended for the purpose.

Notes on rubber-yielding trees (*Bul. Bot. Dept. Jamaica, n. s., 2 (1895), No. 3, pp. 31–38*).

DISEASES OF PLANTS.

Field experiments with fungicides, B. D. HALSTED (*New Jersey Stas. Bul. 108, pp. 32, dgms. 2*).

Synopsis.—A report is given of field experiments with fungicides for the control of the diseases of turnips, cabbage, tomatoes, potatoes, and beans.

A preliminary report of this paper was read before the section on horticulture and botany of the Association of American Agricultural Colleges and Experiment Stations at its meeting in November, 1894, a brief abstract being given in E. S. R., 6, p. 267.

The experiments were conducted on an acre, equal portions of which were devoted to each crop. Diagrams are given of the area used in the experiments, showing the manner in which it was divided. Each of the one fifth acre portions, called series, was divided into 4 plats, and these in turn were divided into 6 equal belts. In this way adjacent portions of essentially the same character could be used for check and test experiments.

Experiments with turnips (pp. 6–14).—The soil selected was badly infected with the club root fungus (*Plasmodiophora brassicæ*), a badly affected crop of turnips having grown upon it the year before. Two crops of turnips were grown and before the seed was sown the soil received treatments of air-slacked lime, gas lime, kainit, and wood ashes in different amounts, and on the cultural belt accompanying every plat were used corrosive sublimate, Bordeaux mixture, and ammoniacal copper carbonate. In the treatment of the first crop the applications to the belts were as follows: Air-slacked lime 150, 75, and 37½ bu. per acre; gas lime 75, 37½, and 18¾ bu. per acre; kainit 1,920, 960, and 480 lbs. per acre; and wood ashes 150, 75, and 37½ bu. per acre. The fungicides used were applied as follows: Corrosive sublimate, 960 gal. of a $\frac{1}{2000}$ per cent solution per acre; Bordeaux mixture, one half strength, 960 gal. per acre, and one half strength ammoniacal copper carbonate, 960 gal. per acre. In belt 4 the plants were sprayed once in 20 days with Bordeaux mixture. Where the full strength of lime was used much of the seed failed to germinate. The gas lime seemed to retard growth to a considerable degree, and kainit, in all strengths used, proved detrimental to germination. Wood ashes did not affect germination, and the plants growing in the belts receiving it grew more rapidly than the others. Five weeks after the seed was sown the presence of club root was shown to some degree and it spread rapidly from that time on.

The crop was harvested July 24 and it was found that the treatments gave almost wholly negative results in preventing club root. August 10 a second seeding was made, the soil having received treatment 4 days before, the proportions of the fungicides being somewhat modified. From the results obtained the author concludes as follows:

> "Air-slacked stone lime gave sufficient evidence of its usefulness as a preventive of club root of turnips to warrant its being recommended for this purpose. When so employed it is advised that it be used at the rate of not less than 75 bu. per acre and applied at least 3 months previous to the time of planting.
>
> "Gas lime, kainit, and ashes all failed to prevent the malady. Gas lime and kainit are both injurious to the crop.
>
> "A half-strength solution of corrosive sublimate applied to the soil at the rate of 4,320 gal. per acre was not harmful to the plants and gave evidence of having materially diminished the amount of clubbing. Equal quantities of half-strength solution of Bordeaux mixture and ammoniacal copper carbonate proved of no value as club root fungicides and were decidedly injurious to the plants. Half-strength Bordeaux mixture applied to the foliage once in 20 days did not prevent turnip-leaf blight."

Experiments with cabbage (pp. 14–18).—The experiments with cabbage were conducted under the same conditions as the experiments above described for the turnips. The conclusions of the author are as follows:

> "Air-slacked stone lime is a preventive of the club root of cabbage. The best results were obtained from the smallest application—that is, at the rate of 75 bu. per acre.
>
> "Gas lime, kainit, and wood ashes are all equally ineffective as club root fungicides.
>
> "A half-strength solution of corrosive sublimate at the rate of 2,160 gal. per acre can not be recommended, for although an apparent preventive of club root, the solution is destructive to the plants. A weaker solution might prove just as effective as a fungicide without interfering with growth.
>
> "Neither half-strength Bordeaux mixture nor ammoniacal copper carbonate when used at the above rate diminished the amount of clubbing and both were very injurious to the plants."

Experiments with tomatoes (pp. 18–20).—In these experiments the object was to test the effect of various strengths and number of applications of Bordeaux mixture and ammoniacal copper carbonate required for the prevention of the various diseases affecting the tomato. Three strengths of solutions were used, and in testing the number of applications required from 2 to 8 sprayings were given the plants. Late in the season several diseases were noticed on sprayed and check plants, but not in any great abundance. The diseases were so poorly shown on the check plants that the results have little if any practical bearing. The experience of the author in staking tomato plants so as to raise the stem and branches clear of the ground led him to conclude that such treatment was not advisable.

Experiments with potatoes (pp. 20–24).—The fourth series of experiments was with potatoes, an effort being made to prevent scab by the use of different strengths and methods of application of corrosive sublimate and Bordeaux mixture. In the cultural belts the plants were sprayed for the prevention of leaf diseases, but so little disease was present on the checks as to render these experiments of little value.

At harvest the tubers were weighed and the weight of sound and scabbed potatoes ascertained. The author's conclusions as to the value of the treatment as shown by his experiments are as follows:

> "Potatoes soaked in, and sprayed in the open rows with, quarter-strength corrosive sublimate gave a larger yield and a lower per cent of scab than did either of the belts treated with half and full strength solutions of the same compound. Similar results followed the treatment of seed potatoes with quarter-strength Bordeaux mixture.
>
> "Although there was but little apparent difference in value between corrosive sublimate and Bordeaux mixture, the former is considered preferable on account of its being more easily prepared, and as it is of a uniform strength throughout admits of a much greater quantity of potatoes being treated at one time than does the Bordeaux mixture, which soon settles unless stirred.
>
> "The cutting of the 'seed,' before soaking in Bordeaux mixture, showed very emphatically the importance of applying the fungicide to the uncut potatoes and preparing them afterwards for planting."

Experiments with beans (pp. 24–30).—Two crops of Golden Wax beans were grown in the last series, the object being to test different strengths and times of application of fungicides. Based on the results of his experiments with the beans, the author concludes that—

> "Soaking bean seed in either full, half, or quarter-strength Bordeaux mixture does not prevent anthracnose.
>
> "Spraying the vines with full-strength Bordeaux mixture or full-strength ammoniacal copper carbonate every 10 days is a partial preventive of anthracnose and bacterial blight, and when applied to the seedlings within a few days after their first appearance and repeated at intervals of 5 days is an almost complete preventive.
>
> "Half-strength Bordeaux mixture and half-strength ammoniacal copper carbonate gave equally good results as leaf fungicides, and are preferable to the full or quarter-strength solutions of either of the above compounds. As fungicides they are as effective as the stronger solutions, and, unlike them, do not injure the vines. The quarter-strength solutions are less effective as fungicides."

The formulas for the fungicides used and methods for their preparation and application are given in detail.

Notes on finger and toe (club root) of cabbage and allied plants, G. MASSEE (*Proc. Roy. Soc., 57 (1895), No. 344, pp. 330–332*).—The author briefly refers to the observations of several authors on the disease of crucifers caused by *Plasmodiophora brassicæ* and gives an account of some experiments conducted by himself. He found (1) that in addition to cultivated plants, several weeds belonging to the order *Cruciferæ* are attacked by *Plasmodiophora*. Hence the necessity of preventing the growth of such weeds in fields, etc. (2) That the germs of disease remain in the soil and retain their vitality for at least 2 years. (3) The development of *Plasmodiophora* is favored by the presence of acids and checked by the presence of alkalies, in this agreeing with fungi rather than bacteria. (4) For the purpose of sterilizing infected soil, experiments prove that either a dressing of lime or a manure containing potash salts is effective, the last being most valuable, as it not only destroys the germs in the soil but arrests the disease in seedling plants and at the same time supplies one of the ingredients necessary for the healthy growth of turnips, etc.

Treatment of melon diseases, F. A. WAUGH (*Oklahoma Sta. Bul. 15, pp. 30–32, fig. 1*).—Brief notes are given of anthracnose of watermelon, due to *Colletotrichum lindemuthianum*. In 1894 experiments were conducted for its repression. Seeds were soaked in Bordeaux mixture and copper carbonate solution before planting, and in a second trial the plants were sprayed at different intervals throughout the growing season. The results were wholly negative and the experiments are to be repeated.

Potato blight and potato scab, F. W. RANE (*West Virginia Sta. Bul. 38, pp. 39–46, figs. 5*).—A popular bulletin in which potato blight due to *Macrosporium solani* and potato scab are figured and described. The use of Bordeaux mixture is advised as preventive treatment for the blight and soaking seed potatoes in corrosive sublimate for the prevention of the scab. Notes are given on spraying apparatus and also list of firms making such machines.

The author tested the effect of barnyard manure and lime on the production of scab. The most scab was found in the plats receiving the manure, the plat receiving lime gave the next amount, lime and manure still less, and no treatment gave the least amount of scab. All the seed was untreated in this experiment.

Potato scab, J. TROOP (*Indiana Sta. Bul. 53, pp. 120–122, figs. 2*).—The author conducted some experiments to ascertain (1) whether or not the disease is developed more rapidly in muck soil than in sandy loam; (2) whether a single crop of scabbed potatoes will render the soil unfit for a future crop, and (3) the effect of treatment on the yield. The tubers were soaked in a solution of corrosive sublimate, 2 oz. to 16 gal. water, for 1, 1.5, and 3 hours. In every case the longer the seeds were soaked the less was the amount of scab. In the case of the muck soil there was a greater amount of scab on both treated and untreated plats than on the upland soil. In the muck the untreated plats gave 60 to 65 per cent scabbed tubers, as compared with 3.5 to 5.75 per cent for the treated plats. On the upland the amount of scab was reduced to 2 per cent by the treatment. The germs from an infected crop of the previous year materially increased the amount of scab at harvest. Owing to a frost killing some plants the third inquiry was abandoned, as the results were too unreliable for comparison.

Potato scab and its prevention (*Iowa Sta. Bul. 27, pp. 120–129, figs. 3*).—Compiled notes are given concerning the cause of potato scab, and suggestions are given for its prevention. Experiments were conducted to test the relative value of corrosive sublimate, ammoniacal copper carbonate, potassium sulphid, Bordeaux mixture, ferrous sulphate, soda hyposulphite, and a sulphur mixture for the prevention of scab. Owing to the season the results obtained were such that no definite conclusions could be drawn, but the corrosive sublimate was thought to have given the best results, when total yield and per cent of scab are considered.

Ruta-baga rot, L. H. PAMMEL (*Iowa Sta. Bul. 27, pp. 130–134, pl. 1*).—An abstract of this article was presented to the section on botany and horticulture of the Association of American Agricultural Colleges and Experiment Stations at its meeting in November, 1894 (E. S. R., 6, p. 268).

The disease was first noticed in 1892 and in 1893 was so severe as to destroy in one case more than 50 per cent of the crop. When present this rot may be recognized by its peculiar odor. Usually the crown of the root is the portion first affected, but occasionally the bases of the leaves are first to show the disease, or it may appear on the side of the root. The leaves of all plants affected were spotted, but the author has not attempted to study the relationship between the leaf spotting and the rotting of the roots. The fibrovascular bundles of diseased roots become black and the adjacent parenchyma is of a watery appearance. In roots badly affected the cortex easily separates from the fleshy portion. Sometimes the stems and roots become hollow, containing an ill-smelling fluid. In this fluid numerous bacteria were found, some of which were isolated, and from inoculation experiments one was found that the author considers the cause of the disease. He has given to it the name *Bacillus campestris* n. sp., characterized as follows:

> "Bacillus varying somewhat in length from 1.87 μ, 2.25 μ, to 3 μ, width uniform 0.37 μ. Rods rounded at ends, occurring singly or in chains of two or three, staining uniform and readily with fuchsin and gentian violet; in old cultures it stains with difficulty. In hanging drops the bacillus exhibits a lively motion. The organism has considerable vitality, cultures 4 months old growing readily when transferred. Spores not observed."

In the various cultures the bacteria produces a characteristic yellowish growth.

The disease affects ruta-bagas and yellow turnips. No specific suggestions are given for its prevention.

Observations on Plowrightia morbosa, S. A. BEACH (*New York State Sta. Rpt. 1893, pp. 686–688*).—During 1893 a plum nursery was examined at the request of its owner for black knot. The young trees were budded in 1891 and in 1893 no wood was left above the union but 2-year-old growth. One side of a block of the young trees was bordered by a row of bearing plum trees that were badly affected by the black knot, some of the branches of the diseased trees overhanging the nursery stock. In 1892, after the leaves had fallen, all knots were cut from the old trees. On June 28, 1893, nearly every young tree immediately under the old ones was badly affected, and a careful inspection showed some evidence of the disease in other rows. The conclusion of the author is that the infection undoubtedly came from the older trees-there being no other adequate source of infection, and from the fact that the young trees under the drip of the older ones were the ones worst affected.

The author claims that the infection of the young trees could only have been through the conidia formed during 1892, as the old knots had been removed in the fall of 1892 before any ascospores were formed. This point is of economic interest in showing that a serious attack of the disease may follow from the conidia formed during the summer months as well as through the ascospores formed during the winter and early spring.

Spraying orchards and potato fields, L. R. JONES (*Vermont Sta. Bul. 44, pp. 81–102, figs. 14*).

Synopsis.—A report is given on the relation of weather of 1894 to plant diseases, apple and pear scab and the means for its repression, results of spraying potatoes in 1894, observations upon the date of planting potatoes, and on the prevention of potato scab.

Relation of weather of 1894 to plant diseases (p. 82).—Owing to the remarkably dry season of 1894 there were no serious attacks of parasitic fungi, some plants escaping almost entirely. While plant diseases were not troublesome the dry weather brought conditions resulting in unusual insect activity. The results shown on the sprayed plats, while not as marked as in previous years, still gave enough difference over the unsprayed crop as to indicate that spraying will be profitable.

Apple and pear scab (pp. 82–93).—Illustrated notes are given on the cause of apple and pear scab and the results of a series of experiments conducted for its repression are reported. Three varieties of apple trees and 1 of pears were sprayed with Bordeaux mixture, different lots of the trees receiving 4, 5, 6, and 7 applications. The results given showed that for that year 4 sprayings were sufficient. The gains as shown by the character of the fruit produced were 23, 24, and 27 per cent for the apples and 117 per cent for the pear trees. Directions are given for the preparation and application of the fungicide.

Results of spraying potatoes in 1894 (pp. 93–98).—Applications of Bordeaux mixture were given to the potato plants, but owing to the dry season but little disease was noticed. There were, however, severe ravages of grasshoppers and flea beetles. The use of the usual insecticides seemed to have little effect, but it was noticed that those plants which had been sprayed with Bordeaux mixture escaped serious injury. From the treated plats an increased yield over the check plats was secured, due no doubt to the combined fungicidal and insecticidal effect of the Bordeaux mixture. The author thinks he is warranted in recommending the use of Bordeaux mixture on either early or late varieties of potatoes during either a wet or dry season. Paris green may be added to the mixture for the destruction of the Colorado beetle.

Observations on the date of planting potatoes (pp. 98–100).—In the Annual Report of the station for 1893, p. 55 (E. S. R., 6, p. 908), the author called attention to the greater liability to disease of late planted potatoes. Ordinarily the early crop of potatoes is less productive than the later, owing to the fact of the tubers usually maturing in July, the driest month of the year, but in 1894 the season was so peculiar that the early crop was the most productive. It is believed that for the average season late planting is the most profitable, in spite of the fact that the plants must be sprayed to protect them against the late blight.

Potato scab (pp. 100-102).—Brief notes are given on the cause of potato scab and recommendations given for its prevention. The author advises the use of clean seed, planting in clean soil, and the use of clean fertilizers. Where the seed potatoes are not known to be free from the scab it is suggested that they be soaked in a solution of corrosive sublimate before planting. After such a treatment the yield of merchantable potatoes in one of the author's experiments increased more than 50 per cent in 1894.

New species of parasitic fungi, S. M. TRACY and F. S. EARLE (*Torrey Bul., 22 (1895), No. 4, pp. 174-179*).—Descriptions are given of the following new species of parasitic fungi: *Puccinia notabilis* on *Pluchea borealis* (?), *P. paspali* on *Paspalum virgatum*, *Ustilago crus-galli* on *Panicum crus-galli*, *U. tonglinensis* on *Ischæmum ciliare* from India, *U. ornata* on *Leptochloa mucronata*, *U. pertusa* on *Setaria macrochæta* from Queensland, *U. pustulata* on *Panicum proliferum*, *Dimerosporium magnoliæ* on *Magnolia virginiana*, *Asteridium illicii* on *Illicium floridanum*, *Sphærella andromedæ* on *Pieris nitida*, *Lembrosia angustiformis* on *Ilex coriacea*, *L. prinoides* on the same, *L. illiciicola* on *Illicium floridanum*, *Vermicularia stachydis* on *Stachys affinis*, *Diplodia minuta* on *Tecoma radicans*, *D. sassafras* on *Sassafras officinale*, *Hendersonia taphrinicola* on blisters of *Taphrina* on *Quercus virginiana*, *Pestalozzia cliftoniæ* on *Cliftonia ligustrina*, *P. breviaristata* on *Tecoma radicans*, *Scolecotrichum punctulatum* on *Iris pabularia*, *Cercospora flexuosa* on *Diospyros virginiana*, *C. graminicola* on *Phleum pratense*, *C. hibisci* on *Hibiscus esculentus*, *C. mississippiensis* on *Smilax glauca* and *S. rotundifolia*, and *Tetraploa divergens* on *Panicum agrostidiforme*.

Grain smuts and potato scab, A. NELSON (*Wyoming Sta. Bul. 21, pp. 24, figs. 4*).—Popular illustrated notes are given on the cause and distribution of grain smuts and potato scab. Directions for the hot water and copper sulphate treatments are given and the former recommended as the more efficient treatment for the prevention of grain smut. For the potato scab soaking the seed tubers in corrosive sublimate is advised and the precautions to be observed in such treatment are mentioned.

Root rot of beets, HILTNER (*Sächs. landw. Ztschr.; abs. in Landw. Centbl. Posen, 23 (1895), No. 14, pp. 79, 80*).

The drooping disease of tomatoes, G. ABBEY (*Jour. Hort., n. s., 1895, No. 774, p. 360*).—A disease due to a slime fungus, *Plasmodiophora tomati*, is described. The treatment is the same as for club root of cabbage.

Diseases of the cherry, L. H. PAMMEL (*Trans. Iowa Hort. Soc. 1893, pp. 248-253*).—An account of the spot disease (*Cylindrosporium padi*), cherry and plum scab (*Cladosporium carpophilum*), cherry powdery mildew (*Podosphæra oxacanthæ*), and black knot (*Plowrightia morbosa*), the descriptions being in sufficient detail to be of value to working horticulturists.

Brunnisure of the vine, U. BRIZI (*Staz. Sper. Agr. Ital., 28 (1895), No. 2, pp. 112-128, pl. 1*).

A root rot of cyclamen, P. SORAUER (*Ztschr. Pflanzenkrank., 6 (1895), No. 1, p. 18*).—A disease caused by the mycellium of a fungus, probably *Thielavia basicola*, in the soil.

A disease of the violet (*U. S. Consular Rpt. 1895, Jan., p. 130*).

Parasitism of Agaricus melleus on oak roots, HARTIG (*Bot. Centbl., 52 (1895), No. 2, p. 48*).

Plant diseases, M. C. COOKE (*Gard. Chron., 17 (1895), pp. 496, 497*).—A lecture on plant diseases, their cause and means of repression.

The occurrence of Peronospora parasitica as influenced by the nature and development of the host plant, P. MAGNUS (*Ber. deut. bot. Ges., 12 (1894), Generalversammlungs number, 1895, Feb. 12, pp. 39–44, pl. 1*).

On the polymorphism of the genus Sporotrichum, E. BOULANGER (*Rev. gén. Bot., 7 (1895), No. 75, pp. 97–102; 76, pp. 166–170*).

Naphtholate of soda as a fungicide (*Prog. Agr. et Vit., 12 (1895), No. 16, pp. 422, 423*).

On combating grain rusts, W. SCHEUTLE (*Fühling's landw. Ztg., 44 (1895), No. 4, p. 131*).

On the prevention of injuries to grain, STEGLICH (*Landw. Jahrg., 3 (1895), No. 8, p. 44*).

When to spray (*Amer. Gard., 16 (1895), No. 38, pp. 180, 181, figs. 5*).—Extracts are given of New York State Station Bulletin 84.

Preventing leaf blight of plum and cherry nursery stock, S. A. BEACH (*New York State Sta. Rpt. 1893, pp. 688–693, pls. 2*).—A reprint of Bulletin 72 of the station (E. S. R., 6, p. 302).

Experiments in preventing pear scab, S. A. BEACH (*New York State Sta. Rpt. 1893, pp. 694–717, pls. 3*).—A reprint of Bulletin 67 of the station (E. S. R., 5, p. 986).

ENTOMOLOGY.

Insect Life (*U. S. Dept. Agr., Division of Entomology, Insect Life, vol. VII, No. 4, pp. 281–360, figs. 7*).—*Special notes* (pp. 281, 282).—These comprise remarks on the new cotton-boll weevil, Florida insects and the December freeze, and Bulletin 33, Division of Entomology.

Further notes on the San José scale, L. O. Howard (pp. 283–295).—A general résumé of the information on this pest, comprising notes on its life history, distribution, original home, future, and remedies. It is stated that the insect does not lay eggs, but is viviparous, the females continuing to give birth to living young for several weeks. It is believed that there are 5 annual generations in the latitude of Washington. *Aphelinus fuscipennis* is the only parasite which has so far been found in the East. The belief is held that the origin of the scale is in Australia. Spraying with a strong solution of whale-oil soap or a very strong resin wash is the only means that has proved effectual as a remedy, but the expense involved will probably interfere with its general adoption.

Report on the Mexican cotton-boll weevil in Texas, C. H. T. Townsend (pp. 295–309).—A report on the life history of *Anthonomus grandis* and the injury inflicted by it on the cotton crop in Texas. Both the larvæ and adults were found to feed on the cotton bolls, the eggs usually being deposited in the unopened flower buds. The weevil infested Texas from the adjacent State of Coahuila, Mexico, and now occupies the extreme southern portion of Texas, keeping near to the coast and extending from Brownsville to San Antonio, or about one sixth of the cotton producing region of the State. It is estimated that a loss of 90 per cent of the cotton crop in the infested region was caused by the weevil in 1894. Burning over all infested fields during the winter, followed by flooding them for a week or two, and rotation of crops for at least 2 years is recommended. It is thought that arsenical spraying when the bolls begin to form may be advantageous. It is urged that cotton raising be abandoned along the southern Texas border to prevent further importation of the weevil, and that legislation be made providing for quarantine measures.

The cotton or melon plant louse, T. Pergande (pp. 309–315).—Bibliographical notes on *Aphis gossypii*, establishing its identity with the orange, melon, and cucumber aphides. A long and varied list of food plants is given and technical descriptions of the pupæ and adult females.

The cotton worm question in 1894, E. A. Schwarz (pp. 315–320).—Notes on the methods adopted throughout the cotton region for combating the cotton worms, the preferred method at present being dusting the plants with Paris green applied by means of sacks attached to a pole on the back of a horse or mule.

Notes on cotton insects found in Mississippi, W. H. Ashmead (pp. 320–326).—A continuation of previous papers. In this installment the Hemiptera, Lepidoptera, and Diptera are treated.

On the distribution of certain imported beetles, F. H. Chittenden (pp. 326–332).—Notes on 18 species of the beetles attacking stored grains, vegetables, dried fruits, and drugs.

Injurious insects and commerce, L. O. Howard (pp. 332–338).—A general paper on the subject, treating briefly of several more injurious insects, chiefly imported, and urging the importance of attentive and watchful study of economic insects and the passage of quarantine laws.

Is Cyrtoneura cæsia an injurious insect? D. W. Coquillett (pp. 338, 339).—A note on the occurrence of this European insect in squash roots in Colorado, where it is believed the flies were present as scavengers.

Insect fertilizers of an aroid plant, H. G. Hubbard (pp. 340–345).—Illustrated notes on the fertilization of the flowers of *Philodendron* sp. in Montserrat by the beetle *Macrostola lutea*, which burrows through the spathe to deposit its eggs upon the spadix, where the flowers are by this means fertilized with pollen from other plants of the species.

Notes and observations on the twig girdler, C. H. Scheffer (pp. 345–347).—An account of the methods employed by *Oncideres cingulata* in laying its eggs and girdling the twigs.

A Cecidomyid that lives on poison oak, D. W. Coquillett (p. 348).—Technical description of *Cecidomyia rhois*, a new species forming galls on the roots of *Rhus toxicodendron.*

A migration of cockroaches, L. O. Howard (p. 349).—A brief note on the migration of several thousand egg-bearing croton bugs (*Ectobia germanica*) from an old restaurant to other buildings.

The potato-bud weevil, F. H. Chittenden (pp. 350–352).—Brief observations on the life history of *Anthonomus nigrinus*, which deposits its eggs in the buds of horse nettles and potatoes. It is believed to be single brooded.

An ortalid fly injuring growing cereals (pp. 352–354).—Notes on the life history of *Chætopsis ænea*, which burrows in the stem of wheat, oats, corn, and sugar cane to a varying extent.

The gray hair-streak butterfly and its damage to beans (pp. 354, 355).—An illustrated note on *Uranotes melinus*, the larva of which has been discovered feeding upon beans, chiefly Limas. The injury has not been serious.

Among *general notes* and *notes from correspondence* may be mentioned the following: A home-made cover for fumigation with bisulphid of carbon, the imported parasite of the Hessian fly, a remarkable migration of butterflies, are tumblebugs beneficial? Margarodes in the United States, the scale insects of Arizona, larvæ in mincemeat, a lachnosterna damaging wheat in Texas, spread of *Cryptorynchus lapathi*, new food plant for the San José scale, the new plum aspidiotus in Illinois, and the Florida red scale in a northern greenhouse.

A preliminary list of the honey-producing plants of Nebraska, C. E. BESSEY (*Nebraska Sta. Bul. 40, pp. 141–152*).—This consists of a list of 157 species of native and introduced plants, yielding nectar, and in many cases pollen as well. It is not stated that hive bees visit all of the flowers included, and the list is undoubtedly far from complete, but it is valuable as being the most extensive list of this nature yet published.

The chinch bug, O. LUGGER (*Minnesota Sta. Bul. 37, pp. 153–182, figs. 12*).—This is a popular bulletin issued for the information of farmers on account of threatened damage by chinch bugs, and treating rather fully of the appearance and life history of the pest, especially mentioning vulnerable points in its habits and its diseases and insect enemies. Directions are given for identifying the chinch bug, particularly by means of the black spots on the white wing covers, and descriptions and figures of the insects most frequently confused with it. The subject of fungus diseases is treated of at length, their action being described in detail, and directions given for their propagation and application to the bugs.

Clean cultivation is urged as a preventive, and in case of an invasion active measures by means of digging ditches into which the bugs may fall during their migrations and can be destroyed by burning; spraying with kerosene emulsion when only the edge of a field is attacked is also advised, but the most confidence is placed in fungus diseases, especially if the weather be damp.

The fruit bark beetle, Scolytus rugulosus, J. TROOP (*Indiana Sta. Bul. 53, pp. 126–130, figs. 7*).—Illustrated descriptive, life history and remedial notes on this fruit pest that has recently begun attacking fruit orchards in Indiana. Apple, pear, plum, peach, and cherry trees seem to be attacked in preference, although various shade and ornamental trees are also infested. The eggs are laid in September by the female burrowing under the bark of the trunk and larger branches, forming little channels where the larvæ feed and hibernate, emerging as adults in early spring. There is a second brood in the summer. The insect was discovered attacking both healthy and diseased trees.

It was found that spraying the trunks and branches with kerosene emulsion, as well as with a combination of Bordeaux mixture and Paris green, prevented the attacks of the beetle over the portion sprayed. Spraying with either of these remedies is therefore recommended, the application preferably to be made before any marks of attacks by the insects are found on the trees. Where trees are severely infested cutting them down and burning them through the winter is advised.

A plum scale in western New York, M. V. SLINGERLAND (*New York Cornell Sta. Bul. 83, pp. 681–699, pl. 1, figs. 4*).—This contains the results of investigations on a supposedly new species of scale insect belonging to the genus *Lecanium*, which has suddenly developed in alarming prevalence in the plum orchards of the State. Notes are given on the appearance of the pest, its life history, damage, enemies, and the most advantageous remedies. The minute, brown, spindle-shaped young scales that have survived the winter on the branches begin to move about April 1, soon locating themselves permanently, increasing rapidly in size, and becoming adult in about 2 months. The adult females are dark brown and almost hemispherical, resembling small brown split peas adhering to the branches, on which white scars are left on the removal of the scales. The males are smaller, flat, elongate, and whitish. Several hundred eggs are laid by each female in June, hatching in about a month, and the young migrate in August and September to the spots where they hibernate. There is but one annual brood.

The damage done by the scales is chiefly confined to plums, although other trees are attacked when adjacent to infested plum trees. The Japanese varieties of plums are apparently exempt from attack.

The twice-stabbed ladybird (*Chilocorus bivulnerus*) feeds upon the scale, both in its larval and adult state, and it is thought that there are also hymenopterous parasites.

Spraying with strong kerosene emulsion about July 1, when the newly hatched scales are detected moving about on the branches, is urged, the application to be repeated during the winter and again in the early spring.

A plate is given illustrating the San José scale for comparison with the plum scale.

Observations on insects—season of 1894, H. OSBORN and C. W. MALLY (*Iowa Sta. Bul. 27, pp. 135–149*).—This bulletin comprises notes on the chinch bug, western onion thrips, squash borer, and melon louse, and was in great part presented before the section on entomology of the Association of American Agricultural Colleges and Experiment Stations at its meeting in Washington in November, 1894 (E. S. R., 6, p. 265).

The chinch bug was destructive over much of the State, and especially so in the southeastern portions. An extended drought the preceding year assisted in the outbreak by favoring the hibernation of the bugs. Wheat, barley, rye, oats, and corn were all attacked to varying extents. The most damage was done where winter wheat had been cropped for some years before, and it is believed that the bugs were favored in their hibernation by the presence of osage hedges. Experiments with the chinch bug fungus diseases were not altogether satisfactory, although they were successful in a number of cases. Energetic treatment is urged to avoid extensive damage this year. Burning over every possible place for hibernation in the fall and early winter is advised, and the plowing of dusty furrows about the fields liable to be attacked. Planting trap strips of grain to attract the bugs, where they may be destroyed by spraying with kerosene emulsion, is also advised.

The western onion thrips (*Thrips alii*) was quite destructive in the State, feeding also upon various other plants besides onions. Several generations developed during the year, attacking the plants by gouging or corroding the surfaces of the stems and causing the leaves to wilt and droop. The insects collected in the axils of the leaves, where they were sheltered, and the eggs were deposited in the leaf substance. Spraying with kerosene emulsion, as soon as the young thrips are hatched, is advised, a second and third application to be given at intervals of from 3 to 5 days. The use of bisulphid of carbon was successful, but possesses drawbacks in the way of trouble and time involved. Destruction of the onion tops by burning as soon as the crop is harvested, is advised. Another allied species of thrips also appeared and caused some slight damage.

The squash borer is described and its life history briefly given. Heavy fertilizing, planting of extremely early and late varieties, collecting the moths by hand in the evenings, destroying badly infested vines, and covering the basal joints of the vines with earth are recommended as remedial measures.

The melon louse was quite damaging throughout the State, destroying many acres of melons and cucumbers, chiefly in August. Its life history is briefly noted, and spraying with diluted kerosene emulsion is recommended, the vines being lifted and the spray applied to the under surface of the leaves as well as to the upper. Experiments were made with different quantities of bisulphid of carbon, applied against the lice for varying times, and the details and results are tabulated. The insecticide was evaporated from small watch glasses or shallow tins placed by the plants, which were covered severally with washtubs, hay caps, and muslin. The muslin coverings proved insufficient to retain the fumes and the general results of the experiments were not altogether satisfactory, in several instances the lice surviving exposure to the fumes for an hour. Experiments were also made with hydrocyanic acid gas, generated in a small dish, and the plants covered for varying lengths of time. These experiments were very successful and the treatment is recommended for effectiveness and cheapness.

The use of bisulphid of carbon and hydrocyanic acid gas on low-growing plants, H. GARMAN (*Kentucky Sta. Bul. 53, pp. 144–150, fig. 1*).—An account of experiments with the above chemicals on the melon louse and rose aphis. The carbon bisulphid was used by introducing a tablespoonful of the fluid under a tub inverted over a melon hill, which was left undisturbed for about an hour and a half. By this means the majority of the aphides were killed, while the vines were not injured. In experiments with hydrocyanic acid gas a small cloth tent 3 ft. in diameter at the bottom and about 3 ft. high was used. This was supported by means of stakes over the plants to be treated, and beneath it was placed a saucer containing 9 cc. of water and 3 cc. of commercial sulphuric acid. To this 3 gm. of potassium cyanid was added. It was found that 4 minutes was a sufficient length of time to kill all insects present, with the exception of mites, and the method is recommended as being quick and effective for exterminating insects on single plants. A rosebush infested with the rose aphis was sprayed with antinonnin, 1 gm. to 1 qt. of water, but the lice were not completely destroyed. Hydrocyanic acid gas was then applied for 10 minutes, killing the insects, but also injuring the leaves of the plant.

The use of arsenites on tobacco, H. GARMAN (*Kentucky Sta. Bul. 53, pp. 125–143, figs. 6*)—This paper was in main part read before the section on entomology of the Association of Agricultural Colleges and Experiment Stations at its meeting in Washington in November, 1894 (E. S. R., 6, p. 265). In addition to the paper as there presented is given a discussion of various forms of apparatus for spraying tobacco, 5 of them being figured. A cart sprayer is believed to be best, but for ordinary purposes some form of knapsack sprayer is recommended, preferably one with a force pump attachment. A nozzle that causes the poison to issue in a fine mist is to be preferred. Spraying with 1 lb. of Paris green to 160 gal. of water is advised, to be first done about July 4 and followed by about 2 subsequent applications at intervals of 2 weeks. At least 2 weeks must elapse between the last spraying and the cutting of the plants.

Spraying for codling moth, H. GARMAN (*Kentucky Sta. Bul. 53, pp. 119–125, fig. 1*).—The results of experiments in spraying apple trees with arsenicals to determine their value as effective means of combating the codling moth. Two trees of Janet, about equal size, were selected for the experiment, and one was sprayed 6 times with arsenical mixtures, once with London purple, and 5 times with Paris green, the applications beginning in July and continuing until after August 27. The adjoining tree was left untreated as a check. The apples which fell to the ground from both trees were picked up on 5 different dates and examined with reference to injuries by the codling moth and rot. From the sprayed tree were examined 834 fallen apples, of which only 19 per cent were free from rot. Of the rotten apples 67 per cent were injured by the codling moth, while 82 per cent of those not rotting were infested. Of the fallen apples from the check tree 27 per cent were rot free, of which 96 per cent were injured by the codling moth, while of the rotted apples but 92 per cent were damaged. Eight hundred and seventy-four apples were picked from the sprayed tree, of which 68 per cent were damaged by the codling moth, while of 816 apples picked from the check tree 81 per cent were injured by the insect.

The conclusions drawn are in favor of spraying with arsenicals for the moth, though the rot fungus is apparently not affected by the application. It is believed from the evidence that the codling moth avoids rotting apples. Apples from the sprayed tree were carefully analyzed by the chemist of the station, but no perceptible quantity of arsenic was discovered.

Insecticides, A. N. CAUDELL (*Oklahoma Sta. Bul. 15, pp. 29, 30*).—Notes on experiments against the squash bug (*Anasa tristis*) with various insecticides, using a combination of pyrethrum powder and kerosene emulsion, and also some odoriferous substances, namely, emulsions of the oils of tansy, cajeput, savin, and eucalyptus. Dusting the plants with lime and pyrethrum was also tried, but none of the remedies were effective.

Household pests, G. H. PERKINS (*Vermont Sta. Bul. 43, pp. 73–78, figs. 4*).—This consists of illustrated descriptive, life history, and remedial notes on the buffalo beetle (*Anthrenus scrophulariæ*), pitchy carpet beetle (*Attagenus piceus*), and clothes moths (*Tinea pelionella, T. biselliella*, and *T. tapetzella*). Benzin and bisulphid of carbon are recommended against all of the species.

Cabbage gall insect (*Gard. Chron., 17 (1895), p. 500, fig. 1*).—Description of *Centiorhynchus sulcicollis*, for which applying gas lime in autumn is recommended.

The reappearance of Pieris protodice, J. A. MOFFAT (*Rpt. Ent. Soc. Ontario 1894, pp. 61, 62*).—Mention of the occurrence of this species in Ontario, where for a number of years it has been superseded by *Pieris rapæ*, with a discussion of the causes of its previous disappearance.

Phylloxera of the vine, A. DESPEISSIS (*Agl. Gaz. N. S. Wales, 6 (1895), No. 1, pp. 13–29, figs. 31*).—The life history of the insect and remedial measures are discussed.

The leaf folder and leaf skeletonizer, H. OSBORN (*Trans. Iowa Hort. Soc. 1893, pp. 174–176*).—Brief notes on *Teras minuta* and *Pempelia hammondi*, spraying with the arsenites being advised.

The gypsy moth, J. FLETCHER (*Rpt. Ent. Soc. Ontario 1894, pp. 67–72, figs. 4*).—A popular discussion of the insect, its life history, damage, and remedies, with an account of the methods employed against it in Massachusetts. Spraying with arsenate of lead is chiefly recommended.

Catastega aceriella, T. W. FYLES (*Rpt. Ent. Soc. Ontario 1894, p. 46*).—Description of the adult form of this maple moth, with brief notes on its habits.

An attack of Ephestia interpunctella, H. A. STEVENSON (*Rpt. Ent. Soc. Ontario 1894, p. 57*).—A brief note on the larva of this moth feeding on raisins. The attack was checked by the use of carbon bisulphid.

Pitcher plant moth, J. FLETCHER (*Rpt. Ent. Soc. Ontario 1894, pp. 44–46*).—Descriptive and life history notes on *Exyra rolandiana.*

Notes on a few Canadian Coleoptera, H. HARRINGTON (*Rpt. Ent. Soc. Ontario 1894, pp. 47–49*).—Brief notes on 21 species of beetles, several of economic value being among the number.

The San José scale, J. FLETCHER (*Rpt. Ent. Soc. Ontario 1894, pp. 73–76*).—Concise descriptive, life history, and remedial notes on *Aspidiotus perniciosus,* kerosene emulsion being given as the best remedy.

Injurious fruit insects of the year 1894, J. FLETCHER (*Rpt. Ent. Soc. Ontario 1894, pp. 76–81, figs. 7*).—Notes on a number of insects that were especially injurious in Ottawa the past season, particular mention being made of the pear tree psylla (*Psylla pyricola*), the apple cigar-case bearer (*Coleophora fletcherella*), an otiorhynchid (*Anametis grisea*), and the spotted paria (*Paria sexnotata*). The psylla was injurious for the first time and is recommended to be treated by means of kerosene emulsion.

Critical catalogue of the myrmecophilous and termitophilous Arthropods, E. WASMANN (*Berlin: F. L. Dames, 1894*).—An important work on the subject in all its bearings.

Kerosene attachment for knapsack spray pumps, H. E. WEED (*Garden and Forest, 8 (1895), p. 187, fig. 1*).

The economic value of parasites, F. M. WEBSTER (*Rpt. Ent. Soc. Ontario 1894, pp. 58–61, figs. 3*).—This paper was read before the section on entomology of the Association of American Agricultural Colleges and Experiment Stations at its meeting in 1894 (E. S. R., 6, p. 266).

Psilura monacha and its bacteria, A. METZGER and N. J. C. MÜLLER (*Mundener Forstliche Hefte. Berlin: J. Springer, 1895*).

Sixth annual meeting of the Association of Economic Entomologists (*Rpt. Ent. Soc. Ontario 1894, pp. 82–112*).—An abridged account of the proceedings and papers of the meeting, some of the papers, however, being printed in full. The proceedings were published at length in Insect Life, vol. VII, No. 2 (E. S. R., 6, p. 650).

FOODS—ANIMAL PRODUCTION.

Miscellaneous analyses of feeding stuffs, H. SNYDER (*Minnesota Sta. Bul. 36, pp. 129–145*).—The averages are given for analyses made at the station of the following materials, and calculation of the digestible materials in the same: Clover hay, pea hay, vetch, timothy hay, blue grass hay, millet, mixed prairie hay, upland prairie hay, blue joint hay, sedge grass, oat hay, corn fodder, wheat straw, oat straw, barley straw, clover straw, green rape, pasture grass, green clover, corn silage, sugar beets, mangel-wurzels, millet seed, barley, corn, oats, peas, rye, wheat, "goose" wheat, flaxseed, corn meal, corncobs, cotton-seed meal, gluten meal, germ meal, linseed meal, oat feed, wheat bran, wheat shorts, wheat germ, wheat flour, wheat screenings, and cockle bran.

An explanation is given of the terms used, the method of calculating the nutrients in a ration, and the fuel value of feeding stuffs. The amounts of nutrients furnished by one dollar's worth of a variety of feeding stuffs at local prices is shown in the following table, which is taken from the bulletin:

Digestible nutrients and heat units bought for one dollar.

Kind of feeding stuff.	Price.		Digestible nutrients.				Fuel value.
	Per ton.	Per bushel.	Dry matter.	Protein.	Ether extract, mainly fat.	Nitrogen-free extract and fiber.	
			Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Calories.*
Bran	$12.00	....	100	20	6	71	194,610
Bran	15.00	....	80	16	5	56	155,045
Corn meal	18.00	....	87	10	3	74	168,915
Corn meal	12.00	....	132	15	5	112	257,345
Corn and cob meal	15.00	....	100	10	3	86	191,235
Corn, shelled	....	$0.50	87	9	3	75	168,915
Wheat shorts	12.00	....	111	17	4	90	216,029
Wheat shorts	16.00	....	85	12	3	70	165,195
Oats	....	.30	72	10	4	56	139,760
Linseed meal	28.00	....	51	19	5	24	91,105
Linseed meal	24.00	....	59	23	6	28	120,210
Barley	....	.48	71	9	2	59	134,930
Peas	....	1.00	48	12	3	36	101,955
Peas	....	.70	68	16	4	49	137,900
Gluten meal	22.00	....	71	22	6	43	146,250
Cotton seed meal	28.00	....	47	23	7	14	97,395
Wheat	....	.50	87	14	2	70	155,987
Timothy hay	8.00	....	127	9	3	108	230,295
Prairie hay	6.00	....	163	11	4	138	294,040
Clover hay	10.00	....	105	15	3	82	193,095
Millet hay	8.00	....	138	10	3	121	256,236
Rye	....	.45	88	13	2	72	166,550

Popular information is given for using the above table in selecting feeding stuffs, and remarks on the factors which influence the composition of crops. Under the latter topic analyses are given of timothy cut at 3 different stages to show the effect of stage of growth on composition. A sample of timothy weighing 25 lbs. was exposed to 1 heavy shower and 3 heavy dewfalls. At the end of 5 days the hay weighed 21.5 lbs. The percentage of each nutrient lost by exposure was, ash 17.26, fat 7.47, protein 7.69, fiber 0.20, nitrogen-free extract 25.78. "The rain removed 12 per cent of the best part of the dry matter of the hay. . . In actual haymaking the loss would have been larger, because some of the hay would have been lost mechanically."

The digestibility of wheat, H. SNYDER (*Minnesota Sta. Bul. 36, pp. 146–148*).—The digestibility of wheat was determined by feeding it to young pigs (1) whole in connection with cracked corn and (2) cracked in connection with corn. Only the average results of the trials are given, which are as follows:

Digestion coëfficient for whole and cracked wheat fed to pigs.

	Whole wheat.	Cracked wheat.
	Per cent.	*Per cent.*
Dry matter	72	82
Ash	44	50
Ether extract (fat)	60	70
Protein (gluten)	70	80
Fiber	30	60
Nitrogen-free extract	74	83

"The results show a difference of 10 per cent digestibility in favor of the cracked wheat. Had the wheat formed more than half of the ration, the difference in digestibility would undoubtedly have been even greater.

"[The above coëfficients are compared with those for cracked barley, wheat, shorts, wheat bran, and cracked corn.]

"The digestibility of cracked wheat compares very favorably with other grains. It does not appear to be quite as digestible as corn, but the dry matter is more digestible than that of barley, shorts, or bran."

When the wheat was fed whole some of the kernels passed the animals undigested. These kernels were washed in distilled water and analyzed, the result being compared with the composition of the wheat as fed.

"The only noticeable difference is about 2½ per cent more water in the wheat recovered from the manure. When the results are compared on the basis of the dry matter the difference in composition between the 2 samples is very slight."

The digestible dry matter and nutrients in a bushel of wheat and of corn are compared as follows:

Digestible nutrients in a bushel of wheat and corn.

	Dry matter.	Fat.	Protein.	Carbohydrates.	Fuel value.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Calories.*
Wheat	43.5	1.0	7.0	35.0	82,345
Corn	43.5	1.5	4.5	37.5	84,407

"When wheat and corn are both selling at 50 cts. per bushel the 50 cts. will purchase the same amount of digestible dry matter of either wheat or corn, but the digestible dry matter in the bushel of wheat contains 2½ lbs. more of digestible protein, while the bushel of corn contains 2½ lbs. more of digestible carbohydrates. The amount of heat units produced by each grain is about the same. . . .

"Furthermore, the manure from the wheat is worth about 25 per cent more than the manure from the corn."

Corn on the cob and corn meal, W. P. WHEELER (*New York State Sta. Rpt. 1893, pp. 235-237*).

Synopsis.—A comparison of corn meal with ear corn on 2 lots of 4 pigs, lasting 63 days. The lot on corn meal made the larger and more economical gain, both financially and for the dry matter eaten.

Eight pigs, Poland China-Duroc cross, weighing about 110 lbs. each, were divided into 2 lots with 2 sows and 2 barrows in each. Both lots received the same amount of a grain mixture (5 parts wheat bran, 3 of cotton seed meal, 1 of linseed meal, and 1 of middlings), and in addition one lot had all the ear corn it would eat and the other lot had an equivalent amount of corn meal. Eighty-nine per cent by weight of the ear corn was kernels. The trial lasted from February 13 to April 17, being divided into 2 periods. The average results follow:

Comparison of corn meal with ear corn on pigs.

Lot.	Food.	Average daily gain in weight.	Food eaten per 100 lbs. live weight per day.		Dry matter eaten per pound of gain.	Cost of food per pound of gain.
			Total.	Dry matter.		
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Cents.*
E	Corn meal:					
	First period	0.75	2.48	2.06	2.75	3.43
	Second period	.70	2.21	1.84	2.63	3.26
F	Corn on the cob:					
	First period	.56	2.65	2.27	4.05	4.11
	Second period	.48	2.22	1.90	3.96	3.96

In estimating the cost of food corn is rated at $15 and corn meal at $20 per ton.

"At the close of the trial the average weight for lot E was 173.4 lbs. and for lot F 155 lbs. The gain made by lot E cost for the first period 16.5 per cent less than that made by lot F and during the second period 17.7 per cent less."

Is it advantageous to feed wheat and rye instead of the bran from the same? A. EMMERLING and P. JENSEN (*Landw. Wochenbl. Schles. Holst., 44 (1894), Nos. 45, pp. 619, 620; 48, pp. 667, 668; 49, pp. 684, 685*).—A controversy as to whether it is most advantageous from a financial standpoint to sell wheat and rye and buy bran for feeding. Emmerling, in the first paper, calculates the value of the digestible nutrients in wheat and bran and concludes that with wheat at 86 cts. per bushel and bran at about $17.25 per ton, the Hamburg prices, it is advisable to sell wheat and buy bran, and states that the same would apply to rye. Jensen criticises his taking Hamburg prices instead of Kiel, and contends that at the local prices for wheat and bran the calculations show the farmer can better afford to feed his wheat than to draw it to market and buy bran.

Emmerling recalculates the values on the basis of prices at a number of points and insists that farmers reasonably convenient to depots are warranted in selling the grain and buying bran.

The source of fat in milk, P. COLLIER (*New York State Sta. Rpt. 1893, pp. 156–173*).—This article opens with a discussion of the mechanism and chemistry of digestion, and of the theories of the formation of fat from albuminoids in the food. Data for the fat in the food and in the milk in the 90-day breed test at the World's Fair are presented, of which the following is a summary:

Fat in food and in milk in World's Fair breed test.

Breed of animals.	Fat eaten.	Fat digested.	Fat in milk.
	Pounds.	*Pounds.*	*Pounds.*
Jerseys	3,884.2	2,706.2	3,516.1
Guernseys	3,756.6	2,486.2	2,784.6
Shorthorns	4,101.1	2,932.6	2,410.0
Total	11,741.9	8,125.0	8,710.7

"It appears that there was upon an average 7.2 per cent more fat recovered in the milk than was digested in the food fed."

The total and digestible fat were calculated from average figures for composition and digestibility of the feeding stuffs used. It is calculated that had the percentage of digestible fat in the concentrated food been 0.38 per cent higher "it would have been sufficient to meet all the demands upon the animals for the fat produced in the milk and the increase in live weight of the animals during the trial."

The results for 1893 of the test of breeds at the station are next cited. It is shown that 23 cows in their first period of lactation, 18 in their second, and 10 in their third consumed the following amounts of food nutrients and produced the following amounts of fat in milk:

Food nutrients eaten and fat produced in milk.

Number of cows.	Period of lactation.	Nutrients eaten.				Fat produced in milk.
		Albuminoids.	Carbohydrates.	Crude fat.	"Pure" fat.	
		Pounds.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
23	First	22,911.20	113,388.10	9,958.90	8,226.10	6,810.20
18	Second	14,063.10	68,023.70	6,454.70	5,331.60	4,363.20
10	Third	6,733.60	30,964.70	3,166.50	2,615.50	2,272.00
	Total	43,707.90	212,556.50	19,580.10	16,173.20	13.445.40
	Ratio	3.25	15.81	1.46	1.20	1.00

"There was during these three periods an average increase of 161 lbs., or a total of 3,134 lbs. in the live weight of the animals under experiment, and if we assume the estimate of 8.7 per cent as the amount of fat represented in this gain it will amount to 272.7 lbs., which, added to the fat of the milk, will give 13,718.1 lbs. as the fat produced by these animals.

"If now we allow the crude fat of the food to contain 17.4 per cent of impurities, there would remain 82.6 per cent, or 16,173.2 lbs. of pure fat in the food eaten by these animals, or 18 per cent more fat than was produced by them in their milk or increase in weight. This will present a loss of 15.3 per cent of the pure fat through lack of digestibility, a loss greater than appears to exist in many experiments made. . . .

"It would seem that until strong proof shall be submitted that the fat of milk is derived from other constituents of the food its source at present must be held as the fat present in the food of the animal.

"It is proposed to make other experiments the coming season to clear up this point, if possible."

Effect of fat on the utilization of the albuminoids of the food, R. LAAS (*Ztschr. physiol. Chem., 20, No. 3, pp. 233–248*).—In 2 experiments dogs were fed on horse flesh freed from fat as far as possible, a quantity of fat being added to this in a second period. The results are believed to warrant the conclusion that the utilization of the albuminoids of the food is increased by the addition of fat—*i. e.*, more nitrogen was stored in the body on a constant ration of nitrogen when fat was added. Accompanying this no diminution in the decomposition process in the intestines could be detected. In this respect the action of fat is unlike that of carbohydrates, which have been found to materially decrease the splitting up of the albuminoids in the intestines.

On the question of the formation of fat from albuminoids in the animal body, M. KUMAGAWA (*Mitt. med. Fac. k. Jap. Univ., Tokyo, 3 (1894), p. 1; abs. in Chem. Ztg., 19* (*1895*), *No. 16, Repert., p. 58*).—The author's experiments were on dogs. They indicated that the animal body is not capable under normal conditions of forming fat from albuminoids. When albuminoids are fed in such large quantity that they alone more than fulfill all the food requirements of the animal, the decomposition of the nitrogen-free materials of the food nearly ceases, and the fat and the carbohydrates of the food are almost completely stored in the body as fat.

Soiling crops, 1894, J. WILSON (*Iowa Sta. Bul. 27, pp. 85–104*).—To test the value of a number of soiling crops, 6 cows, including 2 Holsteins, 2 Shorthorns, and 2 Red Polls, were fed from June 28 to August 28 a basal ration of 5 lbs. of hay and 9 lbs. of corn-and-cob meal per head daily, to which the following green crops were added in separate periods of 7 or 8 days: Peas and oats, red clover, fodder from sweet corn, soja bean, and cowpea. The supply of cowpea was so small that only 2 cows (Holsteins) could be fed upon it. The analyses are given of the soiling crops used, and tests of the composite samples of the milk. Data are also given for the yield of milk and butter, and the flavor, volatile fatty acids, and melting point of the butter produced on each soiling crop. The results are summarized below:

Average results with soiling crops.

Soiling crop.	Yield of milk.	Fat content.	Yield of fat.	Yield of butter.	Qualities of butter.		
					Flavor on basis of 45.	Volatile acids.	Melting point.
	Pounds.	*Per cent.*	*Pounds.*	*Pounds.*		*Cc.*	*Deg. C.*
Peas and oats	160	2.78	4.42	5.16	43	29.95	32.20
Red clover	155	2.96	4.59	5.35	43	29.90	32.60
Corn fodder	134	2.64	3.52	4.10	45		
Soja bean	130	3.08	3.99	4.65	45	28.95	33.00
Cowpea (cows Nos. 115 and 213)	54	3.16	1.69	1.97	43	28.70	32.50
Corn fodder (Nos. 115 and 213)	54	2.17	1.49	1.73			

As the cowpea was fed to only 2 cows, the data are given for these 2 cows while receiving corn fodder, for comparison.

> "The soja bean makes butter of a superior flavor; the creamery experts pronounced it equal to butter from corn. . . .
>
> "The cows did not eat it readily at first, but after getting it sprinkled with bran and salt for a few days they ate it readily. While getting accustomed to it the milk flow shrunk considerably, but at the end of the test period, August 19, they had reached a larger flow than at any time during the feeding of sweet corn, and, notwithstanding the shrinkage while getting used to it, the average daily yield of butter fat reached 3.97 lbs., and the last 4 days of the test went over 4 lbs. This shows the value of plants richer in protein than corn is."

The investigation of the several breeds of dairy cattle with reference to their relative value in the production of milk, butter, and cheese, P. COLLIER (*New York State Sta. Rpt. 1893, pp. 10–156, pls 4*).—The record of this extended investigation is continued from the Annual Reports of the station for 1891 and 1892 (E. S. R., 4, p. 255; 6, p. 68). The record includes 26 cows of the following breeds: Ayrshire, Jersey, American Holderness, Guernsey, Devon, Holstein, and Shorthorn. It covers for some of the cows a part of the first period of lactation, for others parts of the second and third periods, and for 2 cows parts of the third and fourth periods. The data given show for each cow the date of calving, and kinds and amounts of food eaten, the food ingredients eaten, the yield and composition of milk, yield of milk constituents, and general averages for each month of lactation; the relation of fat in the food to fat in the milk in each period of lactation, the cost of production of milk and fat, the percentage variation by months in food and milk constituents, comparisons of successive periods of lactation, and the relative size and number of globules in the milk of each breed in the different periods of lactation; and analyses of mixed hay, corn silage, corn fodder, alfalfa fodder, sorghum fodder, rye fodder, oat and pea fodder, beets, mixed grain, wheat bran, and oats fed in the trial.

Owing to the different periods of lactation in which the cows were, it is impracticable to give any concise statement of the results for the period covered which would not be misleading. The only discussion of the results in the report is with reference to the source of the fat in milk (see p. 1011).

Cotton-seed feed for dairy cows, H. P. ARMSBY and E. H. HESS (*Pennsylvania Sta. Bul. 28, pp. 22*).—"Quite recently there has been brought before the farmers of this State what is designated as 'cotton-seed feed,' which purports to be a mixture of 5 parts of the hulls with 1 of cotton-seed meal by weight. The result is a very bulky feed, weighing about 13 lbs. per bushel, which is offered at the price of $11.50 per ton in bulk in car lots at any point in Pennsylvania."

Analyses of 4 samples of this material and the computed composition of a mixture of 1 part of cotton-seed meal to 5 parts of hulls are given, as follows:

Composition of cotton-seed feed.

Constituents.	Computed 1 to 5.	Sample No. 14510.	Sample No. 15966.	Sample No. 16034.	Sample No. 16562.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Water	13.07	13.07	13.07	13.07	13.07
Ash	3.28	2.45	3.39	2.55	2.92
Albuminoids } Protein	10.05	6.92	9.51	7.21	10.25
Non-albuminoids } Protein		.88	.75	1.22	.40
Crude fiber	36.61	43.28	33.12	32.54	34.31
Nitrogen-free extract	33.22	30.67	36.77	40.66	36.01
Fat	3.77	2.73	3.39	2.75	3.04
Total	100.00	100.00	100.00	100.00	100.00

The cost of a mixture of 1 part of cotton-seed meal to 5 parts of hulls is reckoned at $10.42 per ton, plus the cost of mixing.

The digestibility of cotton-seed feed was determined in an experiment with 3 steers. This material was fed alone from March 23 to

April 21, the excreta being analyzed during the last 7 days. The results, together with those obtained at the North Carolina Station with 2 mixtures of cotton seed meal and hulls, are given, as follows:

Digestibility of cotton-seed feed.

Constituents.	Pennsylvania experiments.				North Carolina experiments.	
	Steer 1.	Steer 2.	Steer 3.	Average.	1 of meal to 6 of hulls.	1 of meal to 4 of hulls.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Dry matter	42	45	43	43	46	54
Ash	20	....	24	15	25	46
Protein	36	32	41	36	46	54
Crude fiber	28	33	32	31	40	45
Nitrogen-free extract	53	59	50	54	50	58
Fat	83	86	84	84	82	85

Upon the basis of the above data the digestible food ingredients in 100 lbs. of material, and the cost of the digestible materials (reduced to starch equivalent) in a number of common feeding stuffs, are computed.

"Both as regards bulk, chemical composition, and proportion of digestible matter the cotton-seed feed corresponds more nearly to a coarse fodder than to a grain feed. The results of our digestion experiments show it to contain rather less total digestible matter than either clover or timothy hay and a little more than good corn fodder. It has, however, a somewhat larger proportion of protein than either corn fodder or timothy hay but less than clover hay. In proportion to the amount of digestible matter which it contains it is a relatively expensive feed, costing more per pound of digestible matter than any of the feeds named in the table with the exception of cotton-seed meal. The indications of the digestion experiments, therefore, are that the feed contains only a moderate amount of actual food and that it is too costly to compete with more familiar feeding stuffs."

Two feeding trials were made to test cotton-seed feed, each with 2 lots of 3 cows each. In the first trial a ration of 8 lbs. of bran and cotton-seed feed *ad libitum* was compared with one of 7 lbs. of corn meal, and 3 lbs. of cotton-seed meal with corn fodder and clover hay *ad libitum*. These were fed in 2 alternating periods of 21 days. The milk was weighed and composite samples taken for testing. Some difficulty was experienced in inducing the cows to eat the cotton-seed feed.

The 2 rations contained practically the same amount of dry matter, but the cotton-seed feed ration contained considerably less digestible matter, owing to its low rate of digestibility. The average results of the trial are summarized in the following table:

Average results of comparison of rations on milch cows.

Ration.	Average daily yield.			Cost of food per pound of product.			Net profit per head daily.	
	Milk.	Milk solids.	Butter fat.	Milk.	Butter fat.	Butter.[1]		
	Pounds.	*Pounds.*	*Pound.*	*Cent.*	*Cents.*	*Cents.*	*Cents.*	*Per cent.*
Hay and corn fodder ration	16.94	2.194	0.745	0.77	17.50	14.87	11.77	90.27
Cotton-seed feed ration	13.74	1.828	.670	.89	18.34	15.59	9.74	79.24

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[1] Assuming 0.85 lb. of butter fat to make 1 lb. of butter.

The cost and profit are based on hay at $10, corn fodder $4, corn meal $18, cotton-seed meal $26, bran $14, and cotton-seed feed $11.50 per ton, butter at 25 cts. per pound, and skim milk at 20 cts. per 100 lbs.

"A ration of cotton-seed feed and bran produced 19 per cent less milk and 10 per cent less butter than one of corn fodder, mixed hay, corn meal, and cotton-seed meal containing an equal amount of dry matter.

"The feed cost per pound of milk was 13 per cent lower and per pound of butter 5 per cent lower on the hay and fodder ration than on the cotton-seed feed ration.

"The net profit per day and head was 17 per cent less on the cotton-seed feed ration than on the hay and fodder ration."

The experiment was repeated, using a second lot of cotton-seed feed. The general plan of the experiment was practically the same as the first, the lots being reversed on the rations. Each lot received 2 lbs. of bran and 6 lbs. of Buffalo gluten meal per head daily, and one lot had clover hay, while the other had cotton-seed feed *ad libitum* as coarse fodder. Four pounds of corn meal was fed to offset the cotton-seed meal in the cotton-seed feed, but this turned out to be too much, as the cows did not eat as much of the feed as was anticipated. From 9½ to 12½ lbs. of the cotton-seed feed was eaten daily, which would contain less than 2 lbs. of cotton-seed meal.

The average daily yield on the cotton-seed feed ration was 15.25 lbs. of milk and 0.763 lb. of butter fat, and on the clover hay ration 17.9 lbs. of milk and 0.814 lb. of butter fat.

"As in the former experiment, the cotton-seed feed ration produced less milk and butter than the ration with which it was compared. . . .

"The financial results of this experiment are slightly in favor of the cotton-seed feed ration, and thus apparently contradict those of the previous trial. It is to be borne in mind, however, that in this second trial the cotton-seed feed was compared with a heavier ration. . . .

"Plainly, however, the first method of comparison is the one best adapted to give a fair idea of the value of the new feed, and hence we shall give much more weight in our conclusions to the results of the first experiment."

The authors' conclusions are:

"(1) The results of these investigations indicate that cotton-seed feed is too expensive, in proportion to the amount of food which it contains, to successfully compete on equal terms with ordinary dairy foods at average prices.

"(2) The results of these experiments show that under average market conditions a very considerable profit may be realized by the conversion of dairy foods into milk and butter. The net profit over the estimated cost of feed and care in these experiments ranged from 77 to 95 per cent."

Pig feeding, different breeds, W. P. WHEELER (*New York State Sta. Rpt. 1893, pp. 224–234*).

Synopsis.—Two experiments in feeding young pigs of different breeds from birth until a little over 7 months old, in one case, and until 10 weeks old in the other. In the experiment for 7 months the average gain, cost of gain, and shrinkage in dressing were practically the same for all breeds. In the other experiment the Poland China and Berkshires made slightly the best gains, but the Duroc and the Duroc-Poland China cross the most economical.

The record is given for 8 Berkshires, 8 Poland Chinas, and 6 Poland China-Duroc cross fed from birth until a little over 7 months old, and for 3 Berkshire-Cheshire cross until 4½ months old. They were kept with the sows until they had learned to eat readily from the trough. They were fed skim milk, to which wheat bran was added during the first 4 weeks, a mixture of equal parts of bran and middlings during the next 5 or 6 weeks, and the same with increasing amounts of corn meal during the remainder of the trial. The nutritive ratio increased from about 1:2.5 at the beginning to about 1:5.8 at the close.

In calculating the cost of food bran is rated at $18, middlings at $20, and corn meal at $22 per ton, and skim milk at 25 cts. per 100 lbs.

"The average weight of the Berkshire pigs at beginning was 3.7 lbs., of the Poland China 2.9 lbs., and of the Poland China-Duroc cross 3.7 lbs. The average weight of the Berkshire-Cheshire cross was 2.1 lbs. At the close of the feeding trial, which lasted a little less than 7 months, the Berkshires averaged 198.8 lbs. in weight, the Poland Chinas 196.5 lbs., and the Poland China-Duroc cross 197.8 lbs. All the pigs were entirely healthy throughout the trial. The cost of all gain made for the whole trial, was for the Berkshires 3.82 cts. per pound, for the Poland Chinas 3.76 cts., for the Poland China-Duroc cross 3.80 cts.—practically the same for all. The Poland China pigs were ready to leave the sow about a week younger than the others. The Berkshire sow lost most in weight while suckling the pigs and the Poland China the least. The cost of food to restore the weight lost was for the Poland China sow 12.41 cts. per pound, for the Berkshire 5.88, and for the Duroc 4.96 cts. per pound. Six pigs from each lot were killed and dressed at the end of the trial and the average loss in weight by dressing was for the Berkshire 22.9 per cent, for the Poland China 21.8 per cent, and for the Poland China-Duroc cross 22.3 per cent. In the feeding experiment made the year before with Poland China, Duroc, and Berkshire pigs at a time when little skim milk was available and only grain was fed, the Poland China made a much more profitable growth than the others."[1]

The record is also given for a number of Poland Chinas, Berkshires, Durocs, and Poland China-Duroc cross fed for 10 weeks, being kept with the sows during the whole trial.

"For the first 5 weeks the food was skim milk and wheat bran, and for the next 5 weeks skim milk and mixed grain, consisting of equal parts of wheat bran and ground oats. . . .

"At the end of 10 weeks the average weights were 37 lbs. for the Poland China, 38.8 lbs. for the Berkshire, 31.1 lbs. for the Duroc, 33.6 lbs. for the Poland China-Duroc cross. . . .

"For the first period the gross cost of the gain made was least for the Poland China-Duroc cross, but considering the value of weight lost by the sow at the cost of afterwards restoring it, the Berkshire pigs made the most profitable gain. For the second period the gross cost of increase of weight was least for the Poland China-Duroc cross, and considering the cost of weight lost by the sow, the cost of the weight gained was least for the Durocs."

Pig feeding, wet and dry feed, W. P. WHEELER (*New York State Sta. Rpt. 1893, pp. 219–223*).

Synopsis.—Two trials to compare the same grain food when fed dry and when soaked. In the first trial both lots of pigs had the same quantity of food, but in the second it was given *ad libitum*. In the first trial the gains were the same on wet and dry feed, but in the second the lot on soaked grain ate a little more and made a slightly greater and more economical gain.

First trial (pp. 219–221).—Fourteen pigs, Poland Chinas, Berkshires, and Durocs, averaging 138 lbs. each, were divided into 2 lots and fed like amounts of food from June 8 to September 4. The food for lot A was mixed with 2 or 3 times it weight of water and allowed to stand 24 hours before feeding, while that for lot B was fed dry. It consisted of corn meal and a mixed grain, which was varied as the feeding advanced. Water was kept before both lots. The results for each lot are tabulated, based on the average per day per 100 lbs. live weight.

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[1] E. S. R., 6, p. 70.

"The total gains made by each lot for the whole trial were almost exactly the same—549 lbs. for lot A and 548 lbs. for lot B. The total food consumed was the same for each lot. Considerable more water was taken by the lot having the wet food. . . .

"The wet food for lot A was always eaten very much faster. . . .

"The average loss in dressing for market was 22.8 per cent for lot A and 22.2 per cent for lot B—practically no difference."

The lot on dry food made the steadier gain.

Second trial (pp. 222, 223).—In this 2 lots of 8 pigs each were used, averaging 133 lbs. in weight, and including Poland Chinas, Berkshires, Durocs, Chester Whites, and a Berkshire-Cheshire cross. The food consisted of corn and a mixture of wheat bran, cotton-seed meal, linseed meal, and middlings, and was fed *ad libitum*. The trial lasted from February 9 to April 13. The results are tabulated as for the first trial.

"The hogs in lot D having the food which was mixed with water and soaked about 24 hours ate a little more than those in lot C having dry food, and made a slightly more economical gain, the cost of the gain in weight being 4.7 per cent less than for the lot having dry food. Lot D took a very little more corn meal in proportion to the mixed grain than did lot C, and the nutritive ratio of their ration was very slightly broader in consequence.

"There was an excessive quantity of food taken by the hogs in both lots, and 2 hogs in lot D suffered from indigestion, etc., after the close of the trial, and 1 (Duroc) died from congestion of liver following indigestion. The increase in weight, as in the first feeding experiment, was less regular with the lot having wet food. . . .

"After the close of the feeding trial the average loss in dressing 5 hogs from lot D was 24.2 per cent, and the average loss in dressing the 8 hogs in lot C was 22.9 per cent."

Horse feeding, R. WARINGTON (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893–'94), pp. 188–196*).—In this article the author gives a concise review of the experiments by A. Müntz on the horses of a tramway company in Paris, those by Grandeau and Leclerc (still in progress) on the horses of a cab company, and those of Wolff at Hohenheim, upon which "nearly the whole of our exact knowledge of horse feeding depends."

Some of the difficulties in the way of arriving at certain fixed data to guide in horse feeding are enumerated.

"Horses are not so generally alike in their powers of digestion, nor in the use they make of food, as a flock of sheep or a herd of cattle. This is, perhaps, partly because the sheep and cattle are always in repose, while the horse being worked to the full extent of his powers any individual weakness becomes apparent. The horse, too, is kept in work till old age, and we consequently have to deal with him both in strength and feebleness. Baudement placed 168 of the French cavalry horses on the same rations and studied the alterations in weight of each horse; he found that horses which were above the mean height, above the mean weight, and below the average age gave the best return for the food consumed."

With reference to the use of coarse fodders the author says:

"Although bulky foods, such as hay or straw chaff, are necessary ingredients of horse rations, a horse is by no means so capable of digesting vegetable fiber as an ox or sheep; the horse. in fact, is not provided with the digestive apparatus belonging to ruminant animals. In Wolff's experiments at Hohenheim, in which the same diet was supplied both to a horse and sheep, the horse succeeded worst in his digestion of the fiber of straw chaff, of grass, and of meadow hay, while in the case of clover and lucern hay he nearly equaled the sheep in digestive power. Wolff in his last report comes to the remarkable conclusion that the fiber digested by a horse is of no value, either as a means of sustenance while at rest or for the production of work. No direct proof of this is furnished; the conclusion is drawn from the lower nutritive and force-producing value of the digested matter of diets including hay. The conclusion has not been generally accepted, and the facts will, perhaps, bear another interpretation."

Experiments on the amounts of food required by a horse at rest, with only sufficient exercise to preserve health, are summarized.

"In Grandeau's experiments with meadow hay alone as the diet 3 horses were kept at rest for various times, amounting in all to 4 or 5 months each, half an hour's walking exercise being allowed per day. Each horse received 17.6 lbs. of hay per day, and this proved exactly sufficient to maintain their weight unaltered. The amount digested by each horse was determined through the whole period by analysis of the solid excrements. The 3 horses did not digest the hay equally well, and thus each horse was really nourished and its weight maintained by somewhat different amounts of food. The average result of 3 months' feeding for each horse was as follows:

Digestible matter required per day for maintenance of horses at rest.

	Live weight of horse.	Dry organic matter digested per day.	
		Actual.	Per 1,000 lbs. live weight.
	Pounds.	*Pounds.*	*Pounds.*
No. 2	897	5.90	6.57
No. 3	853	5.98	7.00
No. 1	806	6.31	7.82
Mean of 3 horses for 14 months			7.02

"Grandeau and Leclerc experimented with many other diets, but in only a few cases did their maintenance diets exactly meet the wants of the horse. The results in these cases are given in the next table, but the results with other diets are of far less authority than those obtained in the more extended experiments with meadow hay.

Dry matter in maintenance rations for horses.

Diet.	Weight of horse.	Dry organic matter per day.		
		In ration.	Digested.	Digested per 1,000 lbs. live weight.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
Hay alone (mean)	868	14.08	6.09	7.02
Maize and oat straw	1.013	11.57	8.33	8.22
Maize, oats, hay, and straw	972	9.48	7.30	7.50
Do	906	9.49	6.74	7.45
Oats alone (crushed)	913	8.50	6.41	7.02

The minimum quantity of albuminoids required to replace the daily waste of the body, judging from the French experiments, must be extremely small. The 3 horses observed by Grandeau received, on an average, 0.538 lb. of digestible albuminoids per 1,000 lbs. live weight daily. But there is evidence that this is not the minimum amount, for one horse averaged only 0.447 lb. of digestible albuminoids per 1,000 lbs. live weight during 2 months, and gained 5 lbs. in weight; and in another case the same horse gained somewhat on a ration of 0.37 lb. of digestible albuminoids. In view of the data at hand, the author is inclined to regard about 0.45 lb. of digestible albuminoids per 1,000 lbs. live weight as the minimum quantity per diem for the maintenance ration of a horse. This makes the nutritive ratio very wide; in the case of the horse cited above it was only 1:12.8.

"Müntz studied the digestive functions of the horse by killing 2 of little value a few hours after they had been fed, and analyzing the contents of the stomach and of successive portions of the intestines separately. One horse had been fed on hay and one on wheat bran. It appeared that all ready-formed sugar was absorbed in the stomach. Starch did not disappear in the stomach; it is digested subsequently by the pancreatic juice. When the food consisted wholly of bran, more than half of the albuminoids and a considerable proportion of the cellulose disappeared in the stomach; but when the food consisted of hay, no assimilation of albuminoids, and scarcely any of cellular matter, took place in the stomach. It is difficult to tell what occurs shortly after leaving the stomach, owing to the large quantity of digestive fluids (bile and pancreatic juice) which are poured into the canal. The largest amount of absorption apparently occurs in the large intestines and colon, and it is here that the most striking diminution takes place in the various cellulose constituents."

In this connection the effect of labor on digestion, as shown by Grandeau and Leclerc's experiments, is interesting.

"Taking the mean of a very large number of experiments with different diets, and taking the proportion of organic matter digested while at rest as 1,000, we have the following series of figures as representing the proportion digested during different degrees of labor:

Relative proportion of food digested.

At rest	1,000
Walking exercise	1,032
At work walking	1,007
Trotting	976
At work trotting	973
At work in cab	959

"We see here that the moderate exercise is accompanied by a small but distinct improvement in the digestive functions, but that as soon as trotting commences digestion becomes less efficient than when at rest, while hard work while trotting still further diminishes the proportion of food digested. When we look into the details we find that the starch and sugar in the food are perfectly digested under all conditions of labor. The digestibility of the fat increases with exercise and does not diminish by labor below the point reached in repose. The digestibility of the albuminoids increases rather considerably with exercise and diminishes sharply when trotting commences. The principal matters usually grouped as 'soluble carbohydrates,' but which in this case are merely the more digestible constituents of the

> fiber, undergo the greatest amount of variation, their digestibility rising considerably with exercise and falling still more considerably with hard labor. In the case of the more insoluble portion of the fiber there is no rise in digestibility by exercise; the maximum rate of digestion is here obtained in repose, and diminishes considerably with increased bodily exertion. On the whole it appears that the constituents of the food which are most affected by rapid exertion are those whose digestion takes place to a large extent in the lower part of the intestines; the motion of the horse probably determines their more rapid passage through the system."

Grandeau's experiments have brought out the marked influence of pace on the amount of labor performed and the food required.

> "Thus a horse walking 12½ miles per day was kept in condition with a daily ration of 19.4 lbs. of hay, while a ration of 24 lbs. of hay was insufficient when the same distance was done trotting. Again, a horse walking the above distance and dragging a load, the additional work being equivalent to 1,943 foot-tons, was sufficiently nourished by a ration of 26.4 lbs. of hay; but a daily ration of 32.6 lbs. (all that the horse would eat) was not enough to maintain the horse's weight when the same work was done trotting."

Some of the reasons mentioned why rapid work is less economical than slow work are the increased work of the heart when the horse is trotting or galloping; the lifting of his own weight at each step, only to allow it to fall again, developing heat; the increase of temperature with exertion, and the loss of heat by evaporation of water through the skin and lungs.

> "The mean quantity of water evaporated daily, under different conditions of exercise, as determined in experiments with 4 different diets, was as follows:

Water evaporated per day.

	Pounds.
At rest	6.4
Walking exercise	8.6
At work walking	12.7
Trotting	13.4
At work trotting	20.6

> "As already explained, the distance trotted was the same as the distance walked, and the load drawn when trotting the same as when walking. The heat consumed in the evaporation of water is very considerable; the loss of water in the breath and perspiration thus necessitates a consumption of food to produce this heat, and diminishes considerably the quantity of food available for the production of work."

As to whether a nitrogenous ration is or is not essential for horses at hard work, it is said that Grandeau's researches do not furnish any information, but that we have to rely chiefly on the investigations of Wolff and of Müntz.

> "The doctrine laid down by Wolff and his fellow-workers at Hohenheim is a very simple one. He distinguishes between the food necessary to maintain the horse at rest without loss of weight and the extra food which must be given when work is performed, if the horse is again to be maintained without its weight suffering loss. Between the weight of digestible matter in this extra food and the quantity of work accomplished there is a tolerably uniform relation. Wolff reckons that digested nutritive matter equivalent to 100 gm. of starch is capable of producing 85,400 kilogrammeters of work, or, expressed in English terms, 1 lb. of starch digested by a horse will accomplish 1,232 foot-tons of work. This is 48 per cent of the full work which

the starch could accomplish if burned outside the body. This result is the average of many experiments with different diets.

"The horse requires for his maintenance in weight while at rest a certain daily supply of albuminoid substance, which must never fall below a certain quantity; but the extra food given when work is to be performed may consist indifferently of any digestible combustible substance, whether albuminoids or not. The horse keeper is thus at liberty to select from a wide range of foods, and is not obliged to give a preference to those which are specially nitrogenous. It should, however, be borne in mind that what has just been said applies strictly only to horses which are already in good working condition. Horses which are low in condition, and must gain in weight of muscle before they are fit for hard work, must, of course, receive a more nitrogenous diet."

The author finds it impossible to state exactly the nutritive ratio of the rations fed by street railway companies in England, as the composition of the foods fed is not known definitely; but from the rations published he fixes the ratio at from 1:7 to 1:8.

Poultry, W. P. WHEELER (*New York State Sta. Rpt. 1893, pp. 214–219*).—The plan is given of a breeding experiment which has now been in progress for 2 years at the station, and a detailed statement of the cost of raising young fowls. About 130 Cochin and Leghorn chickens were hatched by the natural method, for the special purpose of obtaining pullets for use in a feeding experiment. Of the Cochin eggs set 46.1 per cent produced healthy chicks, and of the Leghorn eggs 75.2 per cent. Counting eggs at 24 cts. per dozen, and the food eaten by the sitting hens at local prices, the cost of each chick when hatched was 4.65 cts. for the Cochins and 2.82 cts. for the Leghorns. The hens were kept with the chickens from 5 to 6 weeks. The food of the growing chickens was cracked wheat, skim milk, desiccated beef, finely cut fresh bone, and mixed grain, which was varied from time to time. The chickens remained entirely healthy, and only a few were lost from accidents. The sexes were separated when the Cochins averaged 109 days old and the Leghorns 84 days. At that time the Cochins averaged 4.05 lbs. and the Leghorns 1.83 lbs. The average total cost per chick (including hatching) amounted to 24.36 cts., or 6.01 cts. per pound, for the Cochins, and 12.59 cts., or 6.88 cts. per pound, for the Leghorns.

The pullets of both breeds were fed 11 weeks longer, at an average cost per fowl of 20.07 cts. for the Cochins and 13.09 cts. for the Leghorns, at which time the Cochin pullets averaged 5.53 lbs. and the Leghorns 2.81 lbs. Deducting from the total cost to date the local market value of the cockerels at the time the chickens were separated gives the net cost of the Cochins at 13.24 cts. each and of the Leghorns 16.78 cts.

"The sexes were about equal with the Cochins, but there was an unusual excess in the number of pullets among the Leghorns hatched (37 per cent more pullets than cockerels), so that the poultry value of the cockerels represented a lesser proportion of the value of food consumed. Had the sexes been equal, at the same proportionate cost for growing, and considering the poultry value of the cockerels, the net cost of Leghorn pullets would have been 13.55 cts. apiece, nearly the same as that of the Cochins."

Human food articles (*Massachusetts State Sta. Bul. 57, p. 2*).—Analyses with reference to food ingredients of roasted oats, Hecker's oatmeal, rolled avena, and rolled oats.

Analyses of fodder articles (*Massachusetts State Sta. Bul. 57, pp. 3–5*).—Analyses of Canada hay, linseed meal, Chicago maize feed, wheat bran, corn products, oat feed, Atlas meal (dry distillery feed), and water grass (sedge), the last two with reference to fertilizing ingredients.

Does the palm-nut meal obtained in the extraction process contain carbon bisulphid or other objectionable substance? W. SONNE and A. SCHMIDT (*Ztschr. landw. Ver. Hessen, 1895, No. 10, pp. 73, 74*).—After describing the method by which the meal is obtained in the extraction of oil from palm nuts by carbon bisulphid, the authors mention 2 experiments with meal from a factory in Darmstadt. This meal was found to be entirely free from bisulphid or other similar substance of objectionable smell or taste.

Oleomargarin, a hygienic study, A. JOLLES (*Abs. in. Chem. Ztg., 19 (1895), No. 10, Repert., p. 32*).

Feeding stuff from peat and molasses, A. WAGNER (*German patent; Chem. Ztg., 19 (1895), No. 31, p. 713*).

Detection of adulterants in olive oil, A. MÜNTZ (*Bul. Min. Agr. France, 14 (1895), No. 1, pp. 89–126, fig. 2*).

Digestion of fat in the stomach, C. CONTEJEAN (*Arch. de Physiol.* [*5*], *6, I, p. 125; abs. in Centbl. Physiol., 8, p. 581, and in Chem. Centbl., 1895, I, No. 3, p. 164*).

Digestion products of casein and their phosphorus content, W. VON MORACZEWSKI (*Ztschr. physiol. Chem., 20, No. 1 and 2, pp. 28–51; abs. in Chem. Centbl., 1894, II, No. 23, p. 919*).

The nuclein resulting in the pepsin digestion of casein, J. SEBELIEN (*Chem. Ztg., 18 (1894), No. 102, p. 2018*).—A preliminary note.

How to make the most of the cow in winter, A. POTTIE (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893–'94), pp. 208–212*).—The author argues for warmer stables in winter, and gives the results of his experience and observation with thermometers. He recommends 63° F. as the proper temperature for a cow stable in winter. The cows not only give more milk, in his experience, but are kept in better condition than when the temperature is colder or much warmer. He cites two striking instances in which the milk yield of herds was materially increased and their condition improved by raising the temperature of the cold stables to about 63°.

Cattle feeding, W. P. WHEELER (*New York State Sta. Rpt. 1893, pp. 212–214*).—Remarks on the kinds of food fed in different parts of the year in the test of breeds of dairy cows.

Organized cottage poultry keeping, G. F. C. PYPER (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893–'94), pp. 71–82*).

VETERINARY SCIENCE AND PRACTICE.

Experiments with tuberculin on non-tuberculous cows, J. LAW (*New York Cornell Sta. Bul. 82, pp. 659–676*).—Five healthy cows, 3 of which were giving milk, received weekly full doses of tuberculin, and their temperature was taken every 2 hours, from 9 to 20 hours after injection, and compared with their normal temperature. These injections exercised no noticeable influence on the temperature of the animals, yield of milk, or on the percentage of fat in the milk. "There is nothing in the record of temperatures that would indicate, either at the time of the injection or later, that the tuberculin would prove inimical in any way. So far as there is evidence before us, everything points to the harmlessness of a single test dose on a sound system."

The temperature, yield of milk, and percentage of fat in the milk are tabulated for each animal used in the experiment.

Variability of Bacillus anthrax, A. CHAUVEAU and C. PHISALIX (*Compt. Rend.*, *120* (*1895*), *No. 15*, *pp. 801–807*, *fig. 1*).—A new variety is described, *B. anthracis claviformis*.

Reports of the veterinary colleges of Alfort, Lyons, and Toulouse (France), TRASBOT, ARLOING, and LAULANIE (*Bul. Min. Agr. France*, *14* (*1895*), *No. 1*, *pp. 59–89*).

Report of the Royal Commission on tuberculosis (*Nature*, *52* (*1895*), *May 2*, *pp. 19*, *20*).—A summary.

DAIRYING.

The treatment of milk in the stable (*Landw. Wochenbl. Schles. Holst.*, *45* (*1895*), *No. 11*, *pp. 169*, *170*).—Extracts from a talk by Prof. Fleischmann before a convention of coöperative creamery delegates. The lack of cleanliness in milking is emphasized as a most important cause of inferior dairy products. In Bavarian Algau the creameries forbid straining the milk and require that it be delivered just as milked, in order that they may judge of the cleanliness exercised in the stable by each patron. Their unstrained milk is without doubt cleaner and keeps better than the ordinary carefully strained milk of Schleswig-Holstein. It is stated that in Switzerland the milking is done with the bent thumb and first two fingers, so that the milk can not come in contact with the hand.

Another serious error mentioned is allowing the milk to stand in the stable after milking, and this is far greater where the milk is cooled there with a milk cooler, as is often done. The utmost cleanliness in the care of the cows and in milking is insisted upon as requisite to the finest quality of dairy products, and the further this is departed from the greater the difficulty in making good products. "All the results of scientific investigation which have found such great practical application in the treatment of diseased wounds, in disinfection, and in preserving various products are almost entirely ignored in milking."

Trials of cream-raising systems (*Jour. Bath and West of Eng. Soc.*, *ser. 4*, *4* (*1893–'94*), *pp. 200–207*).—Two series of trials were made under "very unfavorable conditions" to compare the separator (Alpha Baby, hand power), Jersey creamer, shallow pan, and scald cream method. In the latter the milk after being set was scalded on one of the milk scalders commonly used in Devonshire.

> "[The Jersey creamer] consists of a series of metal vessels in which the milk is set at a high temperature. These vessels are jacketed; that is, they have an outer coat which can be filled with water and through which a stream of cold water can flow. The vessels are provided with covers to keep dust from settling upon the cream, but so constructed as to permit of a free circulation of air above the cream. The skim milk is drawn off through a very fine metal sieve, which does not permit the cream to pass through it. When all the skim milk has been removed this sieve can be withdrawn and the cream collected in a separate vessel."

In each trial butter was made from the cream, and analyses of the butter are given. The proportion of the total fat in the milk which was recorded in the butter in the 2 trials was as follows: Separator, 88 and 87.5 per cent; Jersey creamer, 77.5 and 69 per cent; shallow pans, 81 and 78.5 per cent; scald cream, 76.5 and 65.6 per cent.

A fungus on butter, E. J. McWeeney (*Jour. Roy. Agl. Soc. England, ser. 3, 5 (1894), No. 19, pp. 567–569, figs. 5*).—The author describes and figures a fungus causing dark brown spots on butter.* It corresponds to a fungus said to infest the wood used for making butter boxes. It is not mentioned as troublesome as yet.

Observations on Cheddar cheese-making, F. J. Lloyd (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893–'94), pp. 131–176*).—A large amount of tabulated data obtained principally in connection with the Bath and West of England Society's cheese school, including the analyses of the milk, whey, curd, and cheese, together with some bacteriological observations previously referred to (E. S. R., 6, p. 481).

"The results of this year's work confirm in every particular the conclusions which have been come to in previous reports. It is scarcely necessary to reiterate the conclusions come to in this report.

"The work of three years may be summarized as follows:

"To make Cheddar cheese of excellent quality, one, and one single organism only, is necessary in the milk, that is the *Bacillus acidi lactici*; every other organism present will tend to make the work more difficult. Hence it is imperative that scrupulous cleanliness be the primary consideration of the farmer and of the cheese-maker, as of all those who have in the least possible respect to deal with the cows, the milk, or the apparatus employed.

"Secondly. No matter what system of manufacture be adopted, two things are necessary—two results must be obtained. The one is that the whey be separated from the curd, so that when the curd is ground it shall contain not less than 40 per cent of water, nor more than 43 per cent; and the other is that the whey left in the curd shall contain developed in it before the curd is put in the press at least 1 per cent of lactic acid if the cheese is required for sale within 4 months, and not less than 0.8 per cent of lactic acid if the cheese is to be kept ripening for a longer period.

"Lastly. The quality of the cheeses which comply with the foregoing standard will vary according to the quality of the milk from which they have been made, and, proportionately, to the amount of fat present in that milk. The fat is the constituent which most affects the quality of the cheeses; hence it is not possible to expect the same quality of cheese to be made from land which yields large quantities of poor milk as from land which yields small quantities of rich milk. But, with due care, the larger yield of cheese which can be obtained from the poorer milk should balance in value that of the higher quality which can be made from the richer milk-yielding pastures."

The sterilization of milk, A. Rodet (*Rev. Hyg., 1894, No. 12, p. 1025; abs. in Centbl. Bakt. und Par. Med., 17 (1895), No. 13–14, pp. 501, 502*).

Concerning butyric acid fermentation, E. Baier (*Centbl. Bakt. und Par. Allg., 1 (1895), pp. 17, 84, 118*).

The business side of the Babcock test, W. H. Jordan (*Rpt. Maine Bd. Agr. 1893–'94, pp. 109–117*).—A paper on the advantage of scientific methods in dairying and describing experiments at the Maine Station to investigate the value of the Babcock test to practical dairymen.

The manufacture of Cheddar cheese, T. C. CANDY (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893–'94), pp. 127–131*).—Detailed popular description of the author's method.

Experiments relating to the manufacture of Edam cheese, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 244–263, figs. 5*).—A reprint from Bulletin No. 56 of the station (E. S. R., 5, p. 211), with the addition of 4 figures showing press and salting molds.

Experiments relating to the manufacture of Gouda cheese, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 264–275, figs. 4*).—A reprint from Bulletin No. 56 of the station (E. S. R., 5, p. 211).

Study of the cheese-ripening process, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 276–285*).—A reprint from Bulletin No. 54 of the station (E. S. R., 5, p. 85).

Experiments relating to the manufacture of cheese from normal milk rich in fat, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 285–319*).—A reprint from Bulletin No. 54 of the station (E. S. R., 5, p. 85).

Character and extent of investigation made in relation to the manufacture of cheese in cheese factories during the season of 1893, L. L. VAN SLYKE (*New York State Sta. Rpt. 1893, pp. 319–486*).—A reprint of Bulletin No. 65 of the station (E. S. R., 5, p. 892).

Dairying from a business standpoint, G. A. BOWEN (*Rpt. Maine Bd. Agr. 1893–'94, pp. 95–105*).—A general paper recommending accurate and modern scientific methods.

Dairying at the World's Fair, J. GOULD (*Rpt. Maine Bd. Agr. 1893–'94, pp. 133–144*).—A paper briefly discussing the dairy exhibitions at the World's Fair and speaking of their value as public instructors.

General dairy practice, W. D. HOARD (*Rpt. Maine Bd. Agr. 1893–'94, pp. 118–128*).

The progress and conclusions of modern science as applied to practical dairying, W. D. HOARD (*Rpt. Maine Bd. Agr. 1893–'94, pp. 83–90*).—A popular paper on the subject urging the more extensive application among farmers of scientific methods in dairying, the testing of milk, careful feeding, and a systematic study of the herds.

Matzoon, H. J. PATTERSON (*Agl. Sci., 8 (1894), No. 10-11, pp. 447, 448*).—The analysis of this drink made from milk is given.

TECHNOLOGY.

Experiments with corn for brewing, C. SCHUBERT (*Allg. Ztschr. Bierbr. und Malzfabr., 22, p. 888; abs. in Vierteljahr. Chem. Nahr. und Genussmtl., 9, p. 406, and in Chem. Centbl., 1895, I, No. 7, p. 401*).—Experiments in the use of maize for brewing showed that the process was normal and a beer produced which could not be distinguished from normal lager beer by analysis, but had a peculiar taste. The latter is considered disadvantageous to the use of corn for brewing.

The silk industry in France, N. RONDOT (*L'Industrie de la Soie en France. Lyons: 1894, pp. 150*).—This is a comprehensive popular work, largely historical in character, tracing the development of the silk industry in France from the earliest times, and also treating briefly the different processes in the manufacture of silk goods of all sorts, including ribbons, tulles, etc., as well as dress goods. The author states that silk came to us from the Orient, and that Asiatic silk was woven in Europe long before the silkworm itself or the art of drawing threads from its cocoons was known to western peoples. About the middle of the 15th century the true history of silk making in

France begins, the art being in the beginning not so much a trade as a domestic art, mainly practiced by women. In three centuries this paltry industry has become not only one of the first in France but one of the first in the world.

The silk industry has two distinct branches, the first having for its object the production, the second the weaving, of silken threads. The first of these branches is conducted in 24 departments of France, nearly all in the southeastern part of the country, while the manufacture of various silk fabrics is conducted in several large cities, the most important being Lyons. The industry is much subdivided, and it is difficult to make any exact estimate of its proportions, but it is stated that probably 520,000 persons are engaged in it in some way, and that they divide annually 350,000,000 francs in wages and profits. France consumes three tenths of all the silk offered for sale in the world.

The history of silk weaving at Lyons, the most important center of the industry, is treated in chapter X. It started from very small beginnings, being here, as elsewhere, mainly practiced by women, who manufactured narrow strips of silk called tissu or tixu. The industry grew slowly in competition with Italian fabrics, but toward the end of the 18th century was fully established, and after being almost ruined by the French Revolution, revived again in greater vigor than before. A notable tendency of modern silk manufacture has been in the direction of making fabrics only partly of silk, instead of the pure-silk goods once almost exclusively made, the production of such mixed goods having risen from 23,000,000 francs in 1840 to 151,000,000 francs in 1893.

At present the outlook for the silk industry in France is uncertain. The disturbed state of business in general has had its effect here as elsewhere, and the increasing extent to which silk is being made in other countries has lessened to some extent the demand for the French products. Yet from the peculiar fitness of the French people for the delicate manipulations of silk culture and silk manufacture, and in view of the fact that the industry in France has survived other periods of stress, it is thought that French manufacturers of silk will be able by greater exertions to retain the ascendancy in the art which has so long been one of the glories of France. The volume concludes with some statistics (the date of which is not given) of the world's production and consumption of silk, by countries.—R. M. REESE.

Observations on cider making, F. J. LLOYD (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893-'94), pp. 98-106*).—An interesting account of experiments in cider making and fermentation.

Cider making, J. HARPER (*Jour. Bath and West of Eng. Soc., ser. 4, 4 (1893-'94), pp. 82-98*).—Detailed popular directions for making cider according to the most approved method.

Investigations on the viscosity of lubricating materials, etc., G. LUNGE (*Ztschr. angew. Chem., 1895, No. 7, pp. 189-191, fig. 1*).

The relation of bacteriology to tanning, F. H. HAENLIEN (*Centbl. Bakt. und Par. Allg., 1 (1895), p. 26*).

Palmetto extract, a new tanning material, SCHNIZER (*Chem. Ztg., 19 (1895), No. 9, p. 167*).

AGRICULTURAL ENGINEERING.

Water supply in Nebraska, O. V. P. STOUT (*Nebraska Sta. Bul. 41, pp. 153–172, map 1*).

Synopsis.—A preliminary report giving all available data relating to the flow of water in the principal streams of Nebraska and discussing the value of the North Platte, the Loup, Republican, Frenchman, South Platte, and Platte rivers for irrigation, with suggestions regarding storage of flood waters and the use of underground water.

In view of the general attention which has recently been directed to Nebraska as a field for irrigation development, the station "has undertaken the collection of facts and the investigation of conditions which have to do directly with irrigation in Nebraska, and the presentation of results and conclusions in a series of bulletins, of which this one may be considered a preliminary or introductory number."

All accessible data relating to the flow of streams in the State, including the results of gauging made under the direction of the station, are given in tables, and estimates, "as definite as the data will warrant, of the capabilities of each stream to supply a perennial flow to canals," are made. A map shows the location of proposed and completed irrigation ditches in Scotts Bluff and Cheyenne counties, along the course of the North Platte River.

> "Complete statistics as to the whole amount of land now under ditch in the valley of the North Platte are not at hand, but it is believed to be considerably in excess of 200,000 acres. Under constructed ditch, and under survey with prospect of construction, there are at least 600,000 acres."

From the data thus far collected it is estimated that the total minimum summer flow of this river available for irrigation is 3,150 second-feet and that this in connection with the flood water for which storage facilities are being provided is sufficient for the 600,000 acres included in the various irrigation enterprises in this valley.

> "The Loup River, with its several branches and tributaries, is next in importance to the North Platte as a source of supply for irrigating canals. The need for irrigation of the lands which it may water is not, however, so imperative as in the case of the North Platte, but . . . here, as elsewhere in Nebraska, outside the eastern counties, some form or method of irrigation must be devised and put into operation if the agricultural population is to have guaranty of a secure living."

The flow of these streams is very constant, due to the return of seepage water, but the data thus far collected are not sufficient to furnish a safe basis for estimating their capacity for irrigation. Only "the Middle and North Loups, and the main stream below their confluence, present favorable conditions for irrigation development." In other parts of this river system the valleys are so narrow and the adjacent table-lands so high "that even where it is physically possible it is rarely financially practicable or advisable to lead the water to such table-lands."

The Republican River goes dry nearly or quite every summer, and hence can not be relied upon for irrigation. The Frenchman River, however, which flows into the Republican, like the Loup has a steady flow and is being utilized to its full capacity. The area under ditch in the Frenchman and Republican valleys is estimated at a little over 50,000 acres. "The information concerning acres actually irrigated is not complete enough to constitute a basis for a reliable estimate, but the number falls far short of the number of acres under ditch."

Little definite data regarding the Platte and South Platte rivers are given except that "canals of capacity sufficient to utilize the entire amount in dry years are already constructed," and that while the flood value of the Platte is immense the summer flow is very uncertain.

The storage of the flood waters is urged and some of the difficulties encountered in such storage are pointed out.

> "The rather discouraging light in which the subject of storage in ponds, lakes, or reservoirs presents itself causes us to turn in another direction as we seek to prevent the flood waters from passing by unused. In the development of one of the most attractive projects now under consideration in the State it is proposed to place entire dependence upon flood water, which is available in great quantity and is practically all that is available. It is proposed to prepare the subsoil of the fields to receive the excess of water which can be furnished at flood period, and to hold it there until it is needed and drawn up by the crops in the dry part of the growing season. The recorded experience of many years in many countries goes to show that a properly prepared subsoil is efficient as a conserver of moisture, and as previously noted, the results of experiments already made encourage the belief that Nebraska soil will prove to be exceptionally efficient in this way."

The utilization of the underground water supply is discussed.

> "Irrigation by pumping from wells has not yet been practiced to any great extent in Nebraska. It is almost certain, however, that within the next few years nearly every farmer in the western and middle part of the State, where conditions are at all favorable, will have from 2 to 15 acres under irrigation by this method."

Detailed information on this subject is to be published in a future bulletin of the station.

Progress of irrigation (*Jour. Frank. Inst., 139 (1895), No. 832, pp. 310–312*).—A summary.

Wide tires, R. STONE (*U. S. Dept. Agr., Office of Road Inquiry Bul. 12, pp. 5–16*).—This bulletin includes extracts from State laws, accounts of experiments with wide tires, opinions of correspondents, newspaper notes, and statements regarding the width of tires prescribed by law in various foreign countries. The evidence appears to be overwhelmingly in favor of the adoption of wider tires than are now in general use.

Construction and ventilation of dairy barns, C. F. CURTISS (*Iowa Sta. Bul. 27, pp. 109–112, figs. 2*).—The construction of a barn 40 by 70 ft. in size and costing $4,000 is described, the special feature consisting in the construction of the ventilators, for which purpose the hay chutes and some of the spaces between the studding of the outer wall and between some of the rafters are utilized.

An underground silo, W. W. COOKE and F. L. WATROUS (*Colorado Sta. Bul. 30, pp. 21–23*).—A silo with a capacity of 64 tons was built on the station farm at a cost of 43 cts. per ton of capacity, or 65 cts. per ton including the cost of partitions for 4 compartments. On a spot which remained dry the whole year a hole 21 ft. square and 8 ft. deep was dug, chiefly with scraper and team. The studs were of 2 by 6 in. lumber resting on a 2 by 6 in. sill and held at the top by a plate of the same size. A single layer of unmatched rough boards, lined with tarred paper, held in place by perpendicular slats, constituted the sheathing. The dirt was filled in against the sides. The silo had no roof, and the silage, covered with straw and 6 in. of moistened dirt, was well preserved.

STATISTICS.

Reports of director and of treasurer of New York State Station (*New York State Sta. Rpt. 1893, pp. 1–211*).—This includes a financial report for the fiscal year ending September 30, 1893; a brief survey of the work and list of bulletins for the year; the needs of the station; World's Fair exhibit of fruits and vegetables and awards to the station, and gifts to the station, together with reports on investigations of breeds of dairy cattle, sources of fat in milk, inspection of commercial fertilizers, and several other studies, all of which are noticed elsewhere under the appropriate headings.

Proceedings connected with the celebration upon the completion of the station building and the organization of the Sheep Breeders and Wool Growers' Association, the State Horticultural Society, and the State Dairy Association, April 5, 1894 (*West Virginia Sta. Special Bul. 2, pp. 82, figs. 17, pl. 1*).

Contribution to the statistics of the indebtedness of the farmers of lower Hesse, C. HUBACH (*Landw. Jahrb., 23 (1894), No. 6, pp. 1035–1043*).

NOTES.

California University and Station.—The State legislature at its recent session gave to the university a special appropriation of $250,000 for a building for the affiliated colleges. It abolished the State Viticultural Commission, to take effect January 1, 1896, transferred the duties of the commission, with a valuable library and set of instruments, to the station, and appropriated $5,000 to carry on its work during the next 2 years; the same appropriation was made for the forestry stations of the university. A dairy bureau has been established by the legislature for the purpose of preventing fraud in the sale of butter and cheese, and its analytical work will be done by the station.

The "alkali soil" question, especially covering the rise and fall of alkali in the soil at the Tulare station during wet and dry seasons and the amounts necessary to seriously affect plant growth, is a prominent subject of investigation, and an extensive series of analyses is being made. The value of the Australian salt bush (*Atriplex semibaccatum*) upon the alkali lands of the State, as food for sheep and cattle at least, has been demonstrated.

Prof. E. L. Greene, the botanist of the station, has resigned, to take effect in June.

During the past year the weight of station bulletins and reports distributed was about 10,000 lbs.

Minnesota University and Station.—A $40,000 dormitory and dining hall is to be erected for the school of agriculture.

Ample sheep and hog barns are to be erected this summer at the university farm, and the basement of the large experiment station barn is being entirely refitted for experiments in feeding dairy and beef cattle.

The dairy hall is to be enlarged this summer to more than twice its present capacity.

The Minnesota legislature, besides giving the agricultural department of the university $65,000 for buildings, appropriated $20,000 for procuring and equipping 2 subexperiment farms, and $10,000 for their maintenance during the current biennial period.

The entomologist of the station has been provided with $5,000 annually, with which to combat the insect pests of the State. The recent movement of the chinch bug into the wheat districts of this State have awakened the farmers to the need of a warfare upon this pest.

The fields of the university farm have been entirely replatted, each field being divided into series 8 rods wide with 16 ft. alleys between, thus providing plats ranging in size from one twentieth of an acre to 2 acres, for the various field trials.

Cornell University and Station.—Several horticultural schools provided under the State appropriation of $16,000 have already been held with very satisfactory results, under the direction of Prof. L. H. Bailey. The schools are from 1 to 5 days duration. Farmers are registered and required to participate in the work. Practical lessons are given in spraying nearby orchards and vineyards.

A great deal of interest is manifested in these schools by fruit growers, and from the number of schools held it seems evident that they are in advance of the good work done in this State by the farmers' institutes.

PERSONAL MENTION.—Dr. R. Sachsse, an agricultural chemist of wide reputation, died at Leipsic, April 25, 1895. Dr. Sachsse was a professor in the University of Leipsic and a frequent contributor to scientific agricultural journals. His book on agricultural chemistry, published in 1888, is widely known.

Dr. J. Brümmer, professor in the University of Jena, and director of the agricultural department of the experiment station of Jena, died March 14, 1895, at the age of 44 years.

Dr. A. von Planta died at Zurich, February 25, 1895, in his seventy-fifth year. Dr. von Planta was never connected officially with any institution but devoted his life to private study in chemical lines, especially the carbohydrates and the chemical activity of bees. A short account of Dr. von Planta's life and works is given by Prof. E. Schulze in *Landw. Vers. Stat., 46, No. 1, pp. 79–84.*

EXPERIMENT STATION RECORD.

VOL. VI. No. 12.

The present number completes the sixth volume of the Record. The extension of the Record work during the year is indicated by the following table, showing the amount of abstracting done for Volumes V and VI, respectively:

	Volume V.	Volume VI.
Station reports	43	42
Station bulletins	267	295
Publications of United States Department of Agriculture	67	78
Foreign articles	227	526
Total number of articles	973	1,606
Classified as follows:		
Chemistry	47	96
Botany	42	53
Bacteriology and zoölogy	10	6
Meteorology	36	86
Air, water, and soil	36	87
Fertilizers	72	95
Field crops	155	398
Horticulture	84	155
Forestry	10	22
Seeds and weeds	24	37
Diseases of plants	66	110
Entomology	71	99
Foods and animal production	119	182
Veterinary science	18	62
Dairying	89	113
Technology	4	6
Agricultural engineering	18	32
Statistics	69	65

The abstracts in this volume occupy 773 pages, and required in their preparation the reviewing of 28,263 pages in the original publications. In addition to this the volume contains 2,104 foreign titles, not abstracted; 20 editorials, occupying 29 pages; 11 special articles, occupying 138 pages, and 79 station notes, occupying 12 pages.

As in previous volumes, the subject index has been made in sufficient detail to serve as a fairly complete guide to the contents of the publications abstracted.

The classified list of abstracts has been omitted from this volume. The number of articles to be catalogued is so large that it is believed that in most cases references to a given subject will be more readily found in the detailed index than in a voluminous subject list of titles.

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